UNITED NATIONS

EP

United Nations Environment Programme

Distr.
LIMITED

UNEP/OzL.Pro/ExCom/35/45
9 November 2001

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-fifth Meeting
Montreal, 5-7 December 2001

PROJECT PROPOSAL: MALAYSIA

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

- National CFC phaseout plan — World Bank

PROJECT EVALUATION SHEET
MALAYSIA

ODS use in sector (2000): 2,143 ODP tonnes

Sub-sector cost-effectiveness thresholds: N/A

Project Titles:

(a) National CFC phaseout plan

Project Data	
Enterprise consumption (ODP tonnes)	2,143.00
Project impact (ODP tonnes)	
Project duration (months)	108
Initial amount requested (US $)	11,400,380
Final project cost (US $):	
Incremental capital cost (a)	
Contingency cost (b)	
Incremental operating cost (c)	
Total project cost (a+b+c)	17,580,207
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	1,799,940
Cost effectiveness (US $/kg.)	
Counterpart funding confirmed?	
National coordinating agency	National Ozone Unit
Implementing agency	World Bank

Secretariat's Recommendations	
Amount recommended (US $)	
Project impact (ODP tonnes)	
Cost effectiveness (US $/kg)	
Implementing agency support cost (US $)	
Total cost to Multilateral Fund (US $)	

PROJECT DESCRIPTION

Introduction

1. The World Bank has submitted on behalf of the Government of Malaysia a national CFC phase-out plan to the 35th Meeting along with a draft performance based agreement to be entered into between the Government of Malaysia and the Executive Committee.

Objective of the Project

2. The project aims at eliminating, over a period of 9 years (2002-2010), the remaining consumption of the controlled substances under Annex A, Group I of the Montreal Protocol, and part of the remaining consumption of 1,1,1 TCA of Malaysia. The remaining consumption of CFCs of Malaysia as of the end of 2000 is calculated as the difference between the consumption of 2000 and the consumption captured in on-going projects as of 31 December 2000, or 2,092 ODP/tonnes – 422 ODP/tonnes = 1,670 ODP/tonnes. The consumption of 1,1,1 TCA which will be phased out as a result of this plan is 33.01 ODP/tonnes, or about 65 percent of the remaining consumption of 51 ODP/tonnes.

Implementation Strategy

3. The national phase-out plan will use a series of instruments, like investment, non-investment, legislation and capacity building to manage the supply and demand of CFCs in order to achieve its goal. The strategy is to eliminate the CFC consumption in the manufacturing sector by 2005 and then gradually reduce the consumption of CFCs in the servicing sector to 0 ODP tonnes of CFC by 2010. The CFC consumption reduction schedule proposed is either in advance of or in compliance with the control schedule of the Montreal Protocol. There will remain a demand for CFC 12 of approximately 240 ODP/tonnes after 2010, which according to the plan will be met either through recycled CFC or CFC imported before 2010 under the allowable import quota.

Components of the Plan

4. From the supply-side, the plan will rely on the application of import licensing to regulate the quantity of CFCs allowed into the country.

5. On the demand side, the plan will use a combination of measures to reduce the demand on a yearly basis to remain in balance with the supply of CFCs. These include policy measures like banning the use of CFCs in the manufacturing sector in 2005 and banning the use of CFCs in the servicing sector in 2010.

6. In addition, the plan will reduce demand by:

(a) completing the implementation of on-going projects;

(b) new investment activities, including an investment project to convert the only remaining CFC based MAC manufacture;

(c) retirement of existing CFC-dependent equipment, including chillers and vehicles;

(d) new vehicle inspection system to prevent an increase in the existing stock of CFC-MAC vehicles.

Cost of the National Phase-out Plan

7. The total cost requested for the implementation of the national phase-out plan is US $11,400,380 and is detailed as follows:

		US $	US $
New investment activities			
	Technical assistance in MDI	57,200	
	CFC 113 phase-out in electronic cleaning	49,720	
	1,1,1 TCA phase out in metal cleaning	561,530	
	Foam sector	1,421,260	
	MAC manufacturing sector	1,259,940	
	Commercial refrigeration manufacturing	137,330	
	Sub-total		3,486,980
MAC servicing			
	Mandatory requirement for MAC inspection	259,600	
	Train-the-Trainer Program	319,000	
	Certification of MAC service technicians		
	Financial subsidy for purchasing MAC servicing equipment	4,026,000	
	Financial subsidy for purchasing MAC R&R equipment	453,200	
	Sub-total		5,057,800
Refrigeration servicing			
	Train-the-Trainer Program	319,000	
	Certification of refrigeration service technicians		
	Financial subsidy for purchasing refrigeration servicing equipment	825,000	
	Sub-total		1,144,000
Custom training			171,600
Implementation unit			1,540,000
Grand total			**11,400,380**

Implementation and Management of the Plan

8. The plan will be managed by the Government of Malaysia through the NOU, with the assistance of the World Bank. The NOU will set up an implementation unit to be directly responsible for the execution of the project on a day-to-day basis. The unit will be financed from the project budget from 2002-2006 and will cease to function after that. NOU will resume full responsibility over the plan from then on.

Funding and Disbursement

9. The Government of Malaysia seeks approval in principle, of the total requested funding, which will be disbursed in 9 tranches annually against a schedule of national CFC consumption targets which are either in advance of or in compliance with the Montreal Protocol schedule. The Government also requests maximum flexibility to utilize the approved funding to achieve the goals of the plan.

Independent Audit and Monitoring

10. The Government will be responsible for the monitoring of the implementation of the plan and the implementing agency will conduct an independent performance audit to determine the achievement of the annual CFC reduction target, which will be the condition for releasing the annual funding.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

11. The Secretariat has discussed the following issues relating to national phase-out plan of Malaysia with the World Bank:

Calculation of incremental costs for investment activities

(a) The MAC manufacturing project

12. The Secretariat has reviewed the MAC manufacturing project and found that the project components are essential for conversion and that the costs are comparable to projects approved previously by the Fund in this sector.

(b) Commercial refrigeration project

13. The requested funding of US $137,330 to convert the remaining four manufacturers is calculated using the average cost-effectiveness of projects funded for Malaysia in this sub-sector and is acceptable.

(c) The foam sector

14. The basis used for the calculation of the costs of the foam sector project is being discussed with the World Bank.

(d) MAC servicing

15. The MAC servicing and recovery and recycling component in the plan has not reflected either the experience or the expenditure which were made under the MAC recovery and recycling project approved for Malaysia in 1992 under the World Bank implementation. Under that project, 200 sets of recovery and recycling MAC equipment were provided. The Secretariat is discussing the cost of this activity with the World Bank.

(e) Phase out of 1,1,1 TCA

16. The national plan includes the phase out of 33 ODP/tonnes of 1,1,1 TCA currently consumed by the relative large industries and leaves a balance of about 19 ODP/tonnes of the substance consumed by smaller users, which according to the plan, will be covered both by investment and non-investment activities under a bilateral project. However it would certainly achieve better results both in terms of cost and efficiency if a sector approach is followed to include both investment and non-investment activities to complete the phase out of the remaining consumption of 1,1,1 TCA. The cost of the phase-out of 1,1,1 TCA has been agreed with the World Bank.

17. The agreement on the total eligible incremental cost of the plan will be communicated to the Executive Committee in due course.

Performance Indicators

18. As the performance indicator, the national phase-out plan includes a schedule of annual CFC reduction targets, which will also be the criteria for releasing the annual funding of the plan. However, due to the difficulty of verifying the consumption reductions, especially in the servicing sector, it is recommended that this performance indicator be supplemented by such other indicators, like the enactment and enforcement of ODS-control policies, which is included in the plan.

19. It is also suggested that the annual work programme, to be submitted in accordance with the proposed agreement should include a detailed description of the activities that have been implemented in the previous year as well as those to be undertaken in the year with matching

expenditures and a discussion of any changes that have been made from the original plan and budget.

Responsibility of Implementation and Monitoring

20. As proposed in the draft agreement, the responsibility of independent monitoring and audit is placed almost solely with the implementing agency, in spite of such provision "as may be directed by the Executive Committee". In order to enable the Executive Committee to exercise its oversight over such multi-year programmes, it is suggested to include a periodic mid-term evaluation, for instance, every 2-3 years, in such multi-year plans which could be administered as part of the annual work programme of the monitoring and evaluation of the Fund.

Support Cost

21. The support cost which is being requested by the World Bank is US $1,162,637 which consists of US $1,014,044 for the national phase-out plan and US $148,593 for the MAC project. In percentage, it comes to 10 percent of the overall cost of the plan at US $11,400,380.

22. Most of the implementation responsibility of the plan will be assumed by the implementation unit which will be funded by the project budget. Some of the responsibilities of the implementation unit are similar to those which are currently being assumed by the financial intermediaries and those responsibilities are being paid by the World Bank from its support cost.

23. Since under the current policy of the Executive Committee on support cost, the support cost for any project with the budget over US $5 million should be decided on the case by case basis, the Executive Committee may want to consider the appropriate level of support cost for this project.

24. Related to the issue of support cost is the assessment of the performance of the implementing agency and whether the performance indicators used for the assessment of the performance of the national plan itself are adequate for measuring the performance of the agency. Or it is necessary to develop additional indicators to that end, including the assessment by the government concerned.

RECOMMENDATIONS

25. Pending.

Malaysia National CFC Phaseout Plan

September 10, 2001

Jointly prepared by the Department of Environment and the World Bank

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CHAPTER 1
INTRODUCTION

1. PROGRAM OBJECTIVE

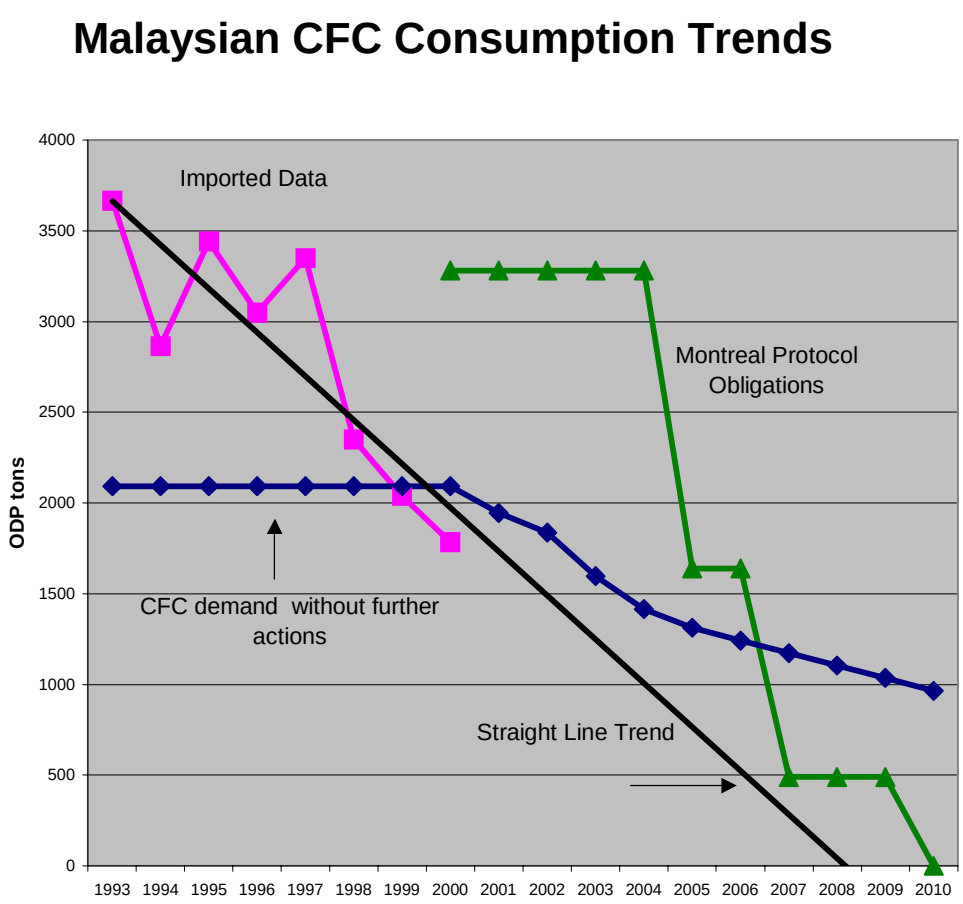
The main objective of this program is to assist the Government of Malaysia to completely phase out its CFC consumption in accordance with the phase-out schedule stipulated by the Montreal Protocol. A total consumption of 2,092 ODP tons of Annex A, Group I chemicals in 2000 will be phased-out under this program. In addition, consumption of 331 tons of 1,1,1-trichloroethane will be phased-out.

To achieve these objectives, the national CFC phase-out program proposes to (i) utilize a combination of policies, regulations, financial support to subsidize the phase-out cost of the industrial sector and (ii) promote refrigerant recovery/recycling, training and technical assistance activities to minimize and eventually eliminate import of CFCs. The program includes necessary technical assistance component for strengthening capacity of the industry and concerned agencies to carry out investment, regulations, and public awareness and participation activities. It also proposes an innovative implementation modality, including a monitoring program, to ensure the successful and effective implementation of this complete CFC phase-out program.

2. THE MONTREAL PROTOCOL (MP) OBLIGATIONS

Background. Malaysia ratified the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer on 29 August 1989. It has also ratified the 1990 London Amendment and the 1992 Copenhagen Amendment. Malaysia is classified as a country operating under Article 5 of the Montreal Protocol as its consumption per capita of Annex A, Group I chemicals is less than 0.3 kg ODP per year. Malaysia does not produce any of the substances controlled under the Montreal Protocol or any of the substitutes for these chemicals. Total demands for Annex A, Group I and Annex B Group I, II and III chemicals are met through imports.

Ability to meet the obligations. Like other Article 5 countries, Malaysia is now entering into the compliance phase of the Montreal Protocol. It is legally binding for Malaysia to comply with all its obligations to reduce consumption (i.e., 50% consumption reduction in 2005, 85% reduction in 2007, and complete phase-out in 2010) in addition to meeting the 1999 freeze.



Graph 1 Malaysia CFC Consumption Trends: Actual and projected

Based on the Government data, to comply with the Montreal Protocol, Malaysia must freeze its consumption of the Annex A CFCs at 3,271 ODP tons by 2000 and then reduce this to 1,635 ODP tons by 2005 and 491 ODP tons in 2007, before final phase-out in 2010.

By 2000 Malaysia had reduced its consumption to about 2,092 ODP tons (2,101 MT) which is well below the target it must meet for the "freeze" and also well on track to meet its target for 1,635 ODP tons in 2005. Based on a straight-line extrapolation, the trend for CFC demand in Malaysia (see Graph 1) indicates that the demand for CFCs will be approximately 700 ODP tons in 2005, which is considerably less than the 50% reduction target of 1,635 ODP tons. This scenario suggests that if current trends continue, Malaysia will not only reach its 85% reduction target in 2007 it will have completely phased out all of its CFC consumption. Tables 1.1 and 1.2 summarize maximum consumption levels of CFC allowed by the Montreal Protocol and the projected consumption based on straight-line trend.

Table 1.1. Projected consumption levels assuming straight-line trend

	1999 – 2004	**2005 – 2006**	**2007 – 2009**	**2010**
Max. Consumption Level Allowed by the Montreal Protocol (ODP tons)	3,271	1,635	491	0
Projected Consumption (ODP tons)	1,000 – 2,100	400 – 900	0	0

It is important to note that to use the straight-line extrapolation as a means for determining future import quotas for CFCs without any due consideration to minimize the CFC demand on the end-user side, may not be realistic particularly for the servicing sector. The phaseout of CFCs in the servicing sector will take longer time than the phaseout of CFCs already achieved in the manufacturing sector. Any measures focusing only on the supply side could lead to illegal imports of CFCs.

The following table provides projection for the future demand of CFCs based on the demand side. Without any further intervention from the Government and the Multilateral Fund and no reverse retrofit or backward conversion, it is expected that the demand for CFCs in 2005 will approximately be 1,311 ODP tons and slowly reduce further to 965 ODP tons in 2010. The further reduction after 2005 is contributed solely to attrition of existing CFC equipment.

Table 1.2 Projected consumption of CFCs (Annex A Group 1) from 2000 – 2005

	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Max. Consumption allowed under Montreal Protocol (ODP tons)	3,271	3,271	3,271	3,271	3,271	1,635
Maximum CFC to be phased-out from already agreed projects due for completion in given year and retirement of existing CFC equipment (ODP tons)		105	132	159	280	105
Consumption with no additional activity. (ODP tons)	2,092	1,987	1,855	1,696	1,416	1,311

Conclusion. While Malaysia has already achieved its 1999 freeze and, based on the past trends, it is likely to meet the 50% reduction target in 2005, Malaysia cannot afford to be complacent, at least for the three main reasons. The expectation that Malaysia will meet the 50% reduction target in 2005 by both approaches mentioned above is made on the basis of the following assumptions:

a) There are no illegal imports leading to a reduction in consumption of legal imports, but no actual drop in demand.

b) There will not be a significant level of topping up new HFC-134a systems with CFC-12, especially in the MAC service sector (i.e. no new demand will be created).
c) The economy does not recover and see the reactivation of manufacturing capacity that is currently idle due to the economic conditions.
d) All companies that have completed phase-out projects under the MLF do in fact stop using CFCs.

It is important to note that most of the reduction in consumption that has been achieved so far has been in the manufacturing sector with due focus on large or medium enterprises which are easily identified. The above analysis shows that Malaysia will probably meet the 50% reduction target of 1,635 ODP tons in 2005. However, the analysis does not take into account the recent economic slow down that has caused significant amounts of manufacturing equipment (reported to be more than 50% of capacity) to remain idle.

Another concern in the manufacturing sector is that in the solvent sector, where there is no legislation to control consumption, demand for CFCs is actually increasing again from a low point in 1998. While some of this is almost certainly stockpiling, the consumption is unlikely to reduce in the absence of legislation.

By far the greatest challenge for all the developing countries is to phase out the use of CFCs in the service sector which entails a large number of small workshops scattering across the country. Unfortunately phasing out CFCs in the servicing sector is the most important factors affecting achievement of the CFC phase out targets in years 2007 and 2010. A conservative estimate suggests that (see Table 4.11) the demand for CFC-12 to service mobile air-conditioners (MACs) in vehicles would be about 823 ODP tons in 2007. This amount is nearly twice the target of 491 ODP tons that Malaysia must reach.

Given the difficulties and uncertainties mentioned above, despite the straight-line trend shown in Graph 1 and in Table 1.1, Malaysia is very likely to face some difficulty in meeting its 2005 obligations and will almost certainly not meet its 2007, 85% reduction target.

Therefore actions are urgently required to address the CFC use in the servicing sector, in particular those required to prevent back-conversion from CFC-free technology to CFCs and to ensure that those enterprises in the manufacturing sector that have already converted to non-ODS technology do not revert to CFCs.

Given the decreasing trend of the world supply for CFCs, it is the Government policy to continue its proactive measures to assist remaining CFC-consuming enterprises to convert to non-ODS technology and to provide technical assistance and promote awareness of the SMEs so that negative impacts of the CFCs phase out are minimum. To facilitate an equal level playing field, the Government will impose new bans and enforce existing bans on the use of CFCs in all parts of the manufacturing sub-sectors as soon as possible. Failure to do so would undermine the achievement attained in the past and it

may jeopardize Malaysia's ability to comply with future Montreal Protocol obligations. The National CFC Phase-out Plan sets out the steps needed in order to meet these objectives.

To achieve significant and sustainable phase-out of CFCs in the servicing sector, a series of investment and non-investment activities, which are necessary to change the behavior of end-users and service technicians, will have to be carried out as soon as possible. It is recognized that these types of activities require a long lead time before substantial reduction of CFCs can be achieved. The National CFC Phase-out Plan also sets out the steps needed in order to ensure Malaysia meets these objectives.

3. PROJECT SUMMARY

The National CFC Phase-out Plan will phase out the remaining consumption of Annex A, Group I chemicals of 2,092 ODP tons over the period of 2002–2010. To achieve this target, a series of investment, non-investment, technical assistance, and capacity building activities will have to be carried out. The National CFC Phase-out Plan will enable the Malaysian Government to ban the use of CFC in the manufacturing sector by 2005 and the use of CFC in the servicing sector by 2010. In addition, the proposed National CFC Phase-out Plan will also phase out imports of 330 MT of 1,1,1-TCA, and 19 MT of CFC-13, by 2005.

Considering this multi-faceted approach it is crucial that flexibility is given to the Malaysian Government to be able to adapt or modify its strategies during implementation of this plan as needs arise. Due to complex and dynamic nature of SMEs, some proposed strategies or approaches to deal with the CFC phase-out in this sector should be able to evolve over time. This is to ensure that the agreed phase-out targets will be met.

The Government of Malaysia is requesting financial support of $11,400,380 from the Multilateral Fund to cover part of the phase-out costs to Malaysia. This requested amount will be allocated to Malaysia over a period of nine years. With 422 ODP tons to be phased out from the projects that have already been approved and funded by the MLF, this proposed funding request will phase out an additional 1,670 ODP tons of Annex A, Group I chemicals for a total phaseout of 2,092 ODP tons and 33 ODP tons of 1,1,1-TCA (Annex B, Group III chemical). Therefore, the overall cost-effectiveness of this National CFC Phase-out Plan is $6.67 per kg ODP.

CHAPTER 2
ODS CONSUMPTION AND DISTRIBUTION BY SECTOR

1. SOURCES OF ODS SUPPLY

In previous years Malaysia has imported CFCs from a range of countries including European and North American countries. However, recent imports have been almost exclusively from India and China, with the majority of companies importing their CFCs from India. There are 34 licensed CFC importers in Malaysia with 12-14 of these being active in any one year. The five larger importers are Perusahaan Kimia Gemilang (PKG), Daichem Enterprises, Keylargo, Westech and Sitt Tatt Chemicals. There are no known cases where CFCs are imported directly by manufacturers of CFC products. A list of the existing importers is included as Annex 1. No new importers will be allowed to imports CFCs to Malaysia.

2. ODS CONSUMPTION BY SECTOR

The ODS consumption in MT as reported to the Ozone Secretariat is shown in Table 2.1. The table also provides estimates for ODS consumption in various sectors and the amount of ODS consumption captured by MLF approved investment projects.

Table 2.1. ODS consumption (import data) by sector (Metric Tons)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Reported ODS Annex A, Group I (CFCs) consumption	4,071	3,587	3,662	4,769	3,442	3,049	3,351	2,351	2,040	1,982
Reported ODS Annex B, Group I (other CFCs) consumption	-	-	-	1	205	19	55	27	35	19
Reported ODS Annex B, Group II (CTC) consumption	-	-	-	19	0	0	0.32	0.79	0	11.5
Reported ODS Annex B, group III (1,1,1 TCA) consumption	2,701	2,829	2,620	2,195	393	351	363	215	760	510
Captured through MLF approved projects	0	0	150	18	1,092	645	73	250	290	200

Sources: Reports from Department of Environment to Multilateral Fund for 1999 and 2000; *"Malaysia Country Programme Update*" Department of Environment, (November 1995); *"Ozone Depleting*

Substances Rapid Sector Assessments Malaysia" Centre for Environmental Technologies (CETEC) Malaysia (September 1999)

A comprehensive survey of consumption by end use sectors was carried out in 2000 as part of the process of preparing the National CFC Phase-out Program. The survey aimed to estimate actual demand for CFCs and solvent (1,1,1-trichloroethane and carbon tetrachloride) in various sub-sectors and the consumption estimates are summarized in Table 2.2. As far as possible the consumption estimates used information provided through the questionnaires and by importers of CFCs and from known users. Data was also taken from relevant reports and the two earlier studies carried out for DOE[1].

Table 2.2. Import and consumption data by sector for 2000

			MT by Sector[1]	**(MT)**
CFC-11				
	Import			603
	Consumption			587
		Aerosol	20	
		Foam	351	
		Refrigeration (Manufacturing)	139	
		Refrigeration (Servicing)	77	
CFC-12				
	Import			1,364.3
	Consumption			1,490
		Aerosol	0	
		Refrigeration (Manufacturing)	35	
		Refrigeration (Servicing)	155	
		MAC (Manufacturing)	0	
		MAC (Servicing)	1,300	
CFC-113				
	Import			15
	Consumption			3.15
		Solvent (Electronic Cleaning)	3.15	
CFC-114				
	Import			0
	Consumption			0
CFC-115				
	Import			0
	Consumption			20.8
		Refrigeration (Manufacturing)	0.8	

[1] They are the draft report prepared by the Centre for Environmental Technologies (CETEC) Malaysia *Ozone Depleting Substances Rapid Sector Assessments Malaysia* (September 1999) and a report *Preparation of a Strategy to phase out consumption of R12 for servicing Mobile Air-conditioners as part of a National CFC Phase-out Strategy for CFC in Malaysia* (February 2000) prepared by Peter Adler for the Swedish International Development Agency (SIDA) and DOE.

		Refrigeration (Servicing)	20	
Total CFC Import				1,982
Total CFC Consumption				2,101
1,1,1-TCA				
	Import			510
	Consumption			331
		Medical products	15.8	
		Textile	0.05	
		Metal Cleaning	314.71	
CTC	Import			11.5
	Consumption			0.1
		Laboratory and Research use	0.1	

[1]Includes reported demand from on-going MLF approved projects.

It is noted that there are differences between the import data and consumption data complied from the survey under this study. This difference probably arises from the fact that normally there is a small inventory maintained by importers and/or chemical distributors. In a certain year, actual consumption may be higher than the amount imported within that particular calendar year. The difference was made up by last year's inventory. Similarly, actual consumption in a certain year may be slightly lower than the actual import. The difference represents the size of the inventory at the importer and wholesaler levels. No attempt was made to track down the inventory of various CFCs at the importer and wholesaler levels.

CHAPTER 3
EXISTING POLICIES AND REGULATIONS

1. THE APPLICATION IMPORT PERMIT (AP) SYSTEM

The primary system of controls on ozone depleting substances in Malaysia is the Application Import Permit System (AP system). The Ministry of International Trade and Industry (MITI) is responsible for administering the AP system under Schedule 2, Prohibition of Import (Amendment) (No. 4) Order, 1994 of the Customs Act, 1967

The AP system was first introduced in Malaysia in 1994. Under these regulations all importers of listed ozone depleting substances i.e. CFC-11, CFC-12, CFC-13, CFC-113, CFC-114, CFC-115, carbon tetrachloride (CTC), and 1,1,1-trichloroethane (TCA), must have an import permit issued by MITI. The total quantity of any substance that can be imported in any year is set by MITI, in consultation with DOE. The amount is reduced each year in line with Montreal Protocol obligations.

In general, the process of issuing of APs by MITI to control imports of CFCs has worked well. APs are being issued and the Royal Customs and Excise Department (Malaysian Customs Service) is checking for these. Useful information has been collected by MITI about end users of the substances. There are however, a number of omissions which need to be addressed. At present the AP system does not control mixtures such as R-502. It also does not cover other controlled substances such as HCFCs. These omissions may lead to false classification of imports as HCFCs or R-502 in order to avoid the AP system. They also make it difficult to collect official data on imports of R-502. These issues will be addressed by the National CFC Phase-out Plan.

2. THE ENVIRONMENTAL QUALITY ACT 1974

The Department of Environment (DOE) is the lead agency for implementing the Montreal Protocol in Malaysia. Once substances have been imported, controls on ozone depleting substances fall under the Environmental Quality Act 1974. Under this Act the DOE has wide powers to control ozone-depleting substances. In particular it is able to prepare regulations "prohibiting or regulating the manufacture, storage, transportation, or the application or use, of any environmentally hazardous substances."

At present, under this Act, DOE has issued two regulations that are relevant to the National CFC Phase-out Program:

- The Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993; and
- The Environmental Quality (Refrigerant Management) Regulations 1999.

The 1993 Order (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) controls the manufacture of aerosols and plastic foams. The regulations require companies to cease using controlled substances as a propellant from 1 January 1994. It also requires all production of all CFC-foam to cease from 1 January 1999. However, the Government has not strictly enforced these regulations and still allowed a "grace period" for companies so they can complete investment projects.

The 1999 Regulations (Refrigerant Management) prohibits the use of CFCs "in any new installation of a building chiller or refrigeration system". It also prohibits the deliberate release of CFCs into the atmosphere. The regulations also require all persons working with CFCs to undertake approved training and to possess an approved recovery and recycling machine. However, this latter section has not been effective as the DOE has not set standards for the required training courses or recovery and recycling machines.

At present there are no controls on the use of ozone depleting substances as solvents in Malaysia. It is also unclear whether the existing controls under the Environmental Quality (Refrigerant Management) Regulations 1999 apply to mobile air-conditioners. These matters will be addressed as part of the National CFC Phase-out Program.

CHAPTER 4
SECTOR BASELINE INFORMATION

1. AEROSOL SECTOR

1.1. NON-MEDICAL PRODUCTS

There are no known aerosol manufacturers in Malaysia that continues to use CFCs as propellants. It is thought that a small number of companies continue to use CFC-11 and possibly 1,1,1-trichloroethane as solvents in limited range of products. The consumption of CFCs in the aerosol industry has decreased steadily from about 500 MT of CFC-11 and CFC-12 in 1994 to an estimated consumption of less than 20 MT of CFC-11 used as a solvent in 2000.

There are six investment projects that have already received funding from the MLF and four of them have been completed (Table 4.1). While the two remaining projects have not been completed in accordance with the ExCom's definition of "physical completion", these projects have already resulted in a significant reduction of CFCs. An estimated consumption in the aerosol sector is less than 20 tons of CFC-11. The average cost effectiveness for projects in the aerosols sector was $4.48, including the umbrella project.

Table 4.1 Status of MLF approved projects in Malaysia aerosols sector

Status of MLF Approved Projects	ODP Phase out by projects (MT)			
	No. of Projects	CFC-11	CFC-12	Total
Completed Projects	4	18	251	269
On-going Projects	2	0	279*	279
Cancelled Projects	0	0	0	0
Total	6	18	530	548

*The actual consumption of these two on-going projects is 20 MT of CFC-11.

1.2. METERED-DOSE INHALERS (MDI)

Malaysia does not produce any CFC MDIs. All MDIs are imported, mainly from developed countries. Currently, there are 35 registered CFC MDI importers with four major MDI suppliers: GlaxoWellcome, AstraZeneca, 3M and Boehringer Ingelheim with GlaxoWellcome having around 50% of the market. In 1999 nearly 2 million MDIs were imported, which were estimated to contain up to 32 metric tonnes of CFCs.

2. SOLVENT SECTOR

In Malaysia solvents have been mainly used for metal cleaning, electronic cleaning, and correction fluid industry. CFC-113, carbon tetrachloride, and 1,1,1-trichloroethane (1,1,1-TCA) are the most common solvent used in this sector. It is noted that other common

names and abbreviations known in the market for carbon tetrachloride are CTC or CCl4 and those for 1,1,1-tricholoethan are methyl chloroform, 111-TCE, or 111-TCA. These similarities can create some difficulties in tracking the actual type and quantities of solvent still being used by the industries.

CFC-113 is almost exclusively used to clean electronic component and its use has dropped steadily from a peak of 1,441 MT in 1989 to 370 MT in 1993. By 1998 consumption had fallen to only 4.21 MT, however, in 1999, imports increased by nearly 5 times over 1998 level to 20.56 MT. In 2000, CFC-113 import remained relatively high at 15 MT.

Imports of 1,1,1-TCA have also been reducing steadily since the early 1990s, largely as a result of the wide range of investment projects in the solvent sector. These projects included the two manufacturers of correcting fluid (who were by far the largest remaining consumers of 1,1,1-TCA in 1998 and 1999) and another project with the Government of France working with at least 40 small and medium scale enterprises (SMEs).

However, in 1999, despite the previous rapid reductions, data from the Statistics Department shows that consumption of 1,1,1-TCA increased to 760 MT, from 215 MT in 1998. Similar to CFC-113, imports of 1,1,1-TCA remained relatively high in 2000 at 510 MT.

Suppliers reported that most ongoing use of ODS solvents continued because it was legal, rather than because users were unaware of alternatives. In some cases concerns about the safety and flammability of some of the possible replacements were reported to be delaying phase-out.

To date, the Multilateral Fund has already provided about $1.87 million to support 11 investment projects to phase out the use of CFC-113 and 1,1,1-TCA. Eight of these projects have been completed. Two projects dealing with CFC-113 and one project using 1,1,1-TCA in the production of correction fluid, were cancelled. In addition to these investment projects, Malaysia also has a bilateral agreement with the French Government to assist Malaysian SMEs in the electronic sector to replace the ODS cleaning process with no-clean technology. The average cost-effectiveness of the eight completed 1,1,1-TCA solvent cleaning projects is $11.60 /kg ODP.

Table 4.2 Status of MLF approved project in solvents sector

Status of MLF Approved Projects	**ODP Phase out by projects (ODP tons)**			
	No. of Projects	**1,1,1-TCA**	**CFC-113**	**Total**
Completed Projects	8	76	0	76
On-going Projects	0	0	0	0
Cancelled Projects	3	80	0	80
Total	**11**	**156**	**0**	**156**

Although 1,1,1-TCA is widely used as a spot cleaning agent in the textile and garment industry in Thailand, there is no evidence that this is a significant use in Malaysia. Through discussion, it was informed that 1,1,1-TCA was used as a mould releasing agent in Malaysia. It was not possible however to identify the quantity of use or any end users.

Information obtained from importer suggested that while the total amount of CFC-113 imported to Malaysia in 1999 was a little over 20 MT and was 15 MT in 2000, it is believed that most of this amount was stockpiled and the 1998 consumption of 4.21 tons is likely to be the current demand. There are two companies that are still using CFC-113 as the solvent and the 2000 consumption was 3.15 MT.

While the total import of 1,1,1-TCA in 2000 was 510 MT, the survey could identify end-users of up to 330.56 MT. There are 20 companies that are still using this solvent and the 2000 consumption was 334 MT of which about 184 MT is used in the international companies and can be phased out quickly by the use of regulations (Table 4.3).

Table 4.3 Solvent consumption by application

Sub-Sector	Application	Number of companies	Consumption (MT)
CFC-113	Electronic Cleaning	2	3.15
1,1,1-trichloroethane	Metal Cleaning	18	314.71
	Textile Industry	1	0.05
	Medical Products	1	15.8
Total		**20***	**333.71**

*Note: Two companies use both 1,1,1-trichloroethane and CFC-113.

But only 13 of them eligible for the MLF funding and consumed about 146 MT of 1,1,1-TCA and 3.15 MT of CFC-113. Current consumption of CFC-113 and 1,1,1-TCA of these companies in various applications may be summarized in Table 4.4.

Table 4.4 Industries in solvent sector that have not received assistance from MLF

Sub-Sector	Application	Number of companies	Consumption (MT)
CFC-113	Electronic Cleaning	2	3.15
1,1,1-trichloroethane	Metal Cleaning	11	130.15
	Textile Industry	1	0.05
	Medical Products	1	15.8
Total		**13***	**149.15**

*Note: Two companies use both 1,1,1-trichloroethane and CFC-113

3. FOAM SECTOR

In Malaysia, CFC-11 is still used widely as a blowing agent to manufacture a range of foam products. Most of the production is either soft foam for cushioning and mattresses,

or insulation foam. The insulation foam is sold either as rigid sheets of solid foam for applications such as cold storage, or it is foamed in place in refrigeration cabinets. In 1995, about 950 MT of CFCs were used in this sector. This amount fell to 380 MT in 1998, and remained static at an estimated level of 375 MT in 1999. It fell again in 2000 to 351 MT as a number of delayed MLF projects were completed and because the economic slowdown suppressed demand for all foam products.

There have already been a relatively large number of projects to phase out manufacture of foams. Sixty six projects have been approved by the Multilateral Fund.

A detailed breakdown of the cost-effectiveness of Malaysian foam projects by sub-sector is shown in Table 4.5:

Table 4.5 Cost effectiveness of Malaysian foam sector projects

Sub-Sector	**No. of Approved Projects**	**Approved Funds ($ million)**	**ODP Phase-out (ODP tons)***	**Cost-Effectiveness**
Flexible PU Slabstock Foam	10	$2.7	449.3	$6.08
Integral-Skin Foam	14	$3.0	330.2	$9.18
Multi-sector	5	$1.0	137.9	$7.41
Polystyrene/Polyethylene Foam	4	$1.1	316	$3.54
Rigid PU Foam	33	$4.6	566.7	$8.27
Total	**66**	**$12.6**	**1800.1**	**$6.98**

*Net ODP reduction takes into account ODP of HCFCs.

By June 2001, 56 projects have been completed and resulted in elimination of 1,617 ODP tons of CFCs (Table 4.6). Alternative technologies employed by these projects include methylene chloride (MeCl), liquid carbon dioxide (LCD), low index additive (LIA) for slab-stock, and HCFC-141b or water for all other applications.

Table 4.6 Status of MLF approved projects in Malaysian foam sector

Status of MLF Approved Projects	**ODP Phase out by projects (MT)**			
	No. of Projects	**CFC-11**	**CFC-12**	**Total**
Completed Projects	56	1,367	250	1,617
On-going Projects	10	183.1	0	183.1
Cancelled Projects	0	0	0	0
Total	**66**	**1,550.1**	**250**	**1800.1**

The 10 on-going projects are scheduled to be completed before the end of 2004. The impact of ODP phase-out from on-going projects to the country's demand for CFCs for the next three years is shown in Table 4.7.

Table 4.7 CFCs to be phased out by ongoing MLF approved projects in foam sector

	2001	**2002**	**2003**	**2004**	**Total**
CFCs to be phased out from on-going projects (MT)	22	5	59	97.1	183.1

Although there is still a considerable amount of CFC being used to manufacture foam (351 tons in 2000), it is suspected that much of the remaining production of flexible foam is being carried out at plants which have already received assistance from the MLF or which are ineligible for assistance. There are cases that the plants which have received assistance have not completed projects or signed off on their projects. All of the 22 MT to be phased out in 2001 (Table 4.7) is from projects that should have been completed in 1997, but had not been signed off by 2000. The Government of Malaysia is taking action to enforce an existing ban on foam manufacturing to ensure that this production stops.

The total amount of CFCs imported for the foam sector in 2000 was 351 ODP tons. The survey result indicates that the remaining consumption of CFC-11 in the foam enterprises that have not received funding from the MLF is 168 tons of which, 150.8 ODP tons are eligible for MLF assistance. This level of consumption is derived from the data obtained from the National CFC Phase-out study (Table 4.8).

There are 35 companies still producing foams with CFC-11 of which 32 companies have been identified as eligible for MLF funding. These 32 eligible companies consumed about 150.8 MT of CFC-11 in year 2000. The breakdown of the companies and their CFC consumption by sub-sector is summarized in Table 4.8 and may be concluded below:

- There are 18 companies producing rigid polyurethane foam with CFC-11 as a blowing agent and a combined consumption is 42 MT.
- There are 9 companies producing flexible polyurethane foam with CFC-11 as a blowing agent and a combined consumption is at least 75 MT.
- There are 2 companies producing CFC-11 blown integral-skin foam and a combined consumption is 3 MT.
- There are three companies producing more than one type of foam products. Its CFC-11 consumption in 2000 is 30.9 MT.

Table 4.8 CFC consumption by sub-sector in Malaysia foam enterprises that have not received funding from the Multilateral Fund

Sub-Sector	Application	Number of companies	CFC-11 Consumption (tons)
Rigid Polyurethane Foam	Insulation	6	5.6
	Rigid panels	12	36.6
Flexible PU Foam	Moulded Foam	9	74.8
Integral Skin Foam	Furniture & Auto Parts	2	2.9
Multi-sector	Flexible and Integral Skin Foam	3	30.9
Total		**32**	**150.8**

4. REFRIGERATION SECTOR

4.1 REFRIGERATION MANUFACTURING SUB-SECTORS

4.1.1. Domestic Refrigeration - Manufacturing

The domestic refrigeration sector includes household refrigerators and freezers. All manufacturing facilities for domestic refrigeration in Malaysia had converted to non-CFC technologies by the end of 1996. There have been 4 projects in this sector, utilizing $3.05 million. These projects have already phased-out 199 ODP tons of CFC-11 and CFC-12. It is estimated that in 2000 there were 3.8 million domestic refrigerators in Malaysia of which most of them (3.6 million) contained CFCs and consumed about 7 MT of CFC-12 for servicing in 2000.

4.1.2. Commercial Refrigeration - Manufacturing

The commercial refrigeration sector includes the use of CFCs as refrigerant in display cases, food storage equipment, refrigerated transport ("reefer" containers) and commercial cold storage facilities. Commercial refrigeration is important to Malaysia because it is primarily used for food storage and transport.

Commercial refrigeration equipment mainly uses CFC-12 and to a lesser extent R-502 (a mixture of 48.8% HCFC-22 and 51.2% CFC-115) as the refrigerants. It is reported that since the mid-1990s most new commercial refrigeration equipment has been manufactured using HCFC-22 as the refrigerant. This is especially the case for larger pieces of refrigeration equipment, such as cold storage facilities, which are usually individually manufactured to the customer's specifications. Some production has continued using CFC, especially of the manufactured equipment, such as drinks cabinets and display cases. Some of the smaller manufacturers still use CFC-12 as the refrigerant and CFC-11 to make the insulating foam.

There remains a small amount of manufacturing of commercial refrigeration equipment using CFC-12 refrigeration and CFC-11 insulating foam. There have already been nine

projects in this sector utilising $3.6 million. Two out of these nine projects are group projects which cover CFC phase-out in 14 small companies. These projects were approved by the ExCom in 2000 and these will phase out CFC use in most of the remaining companies in the manufacturing sector. The average cost-effectiveness of all commercial refrigeration projects for Malaysia is $11.22/kg ODP. Status and additional ODP to be phased out of these projects are summarized in Tables 4.9 and 4.10.

Table 4.9. Status of MLF-approved projects in commercial refrigeration sub-section

Projects	**No. of Projects**	**CFC-11 (ODP tons)**	**CFC-12 (ODP tons)**	**CFC-115 (ODP tons)**	**Subtotal (ODP tons)**
Completed	4	137	19.8	0	156.8
Ongoing	5	129	32.9	0.3	162.2
Cancelled	0	0	0	0	0
Total	**9**	**266**	**52.7**	**0.3**	**319**

Table 4.10. Additional ODP tonnes of CFCs to be phased out by already approved projects

Substance	**2001**	**2002**	**2003**	**2004**
CFC-11	0	41.5	11.8	75.7
CFC-12	0	1.8	7.1	24
CFC-115	0	0.3	0	0
Total	**0**	**43.6**	**18.9**	**99.7**

The National CFC Phase-out study identified four more companies that are still manufacturing new, CFC-based refrigeration equipment for commercial refrigeration applications. Consumption of CFCs in these four companies is less than 3 MT of CFC-12, 1 MT of R-502, and 10 MT of CFC-11 per year.

4.1.3. Other Refrigeration Systems

The study did not find any companies that still using CFCs refrigerant in the manufacturing of the refrigerated transport vehicles. It is believed that the economic slowdown has resulted in very few new refrigerated vehicles in recent years, so although all new refrigerated transport vehicles sold in Malaysia now use HFC-134a or non-ozone depleting blends as the refrigerant, these make up a relatively small part of the overall fleet.

4.1.4. Chillers

Chillers are large centralized cooling devices that are usually used for air conditioning in larger buildings. They can also be used for cooling in industrial processes, but this is less common. Until the mid-1990's most chillers in Malaysia used CFC-11 as the refrigerant, with a smaller number using CFC-12. CFC-114 and R-500 were also used as refrigerants in air-conditioning equipment in the past. It is thought there may be one CFC-114 chiller

and possibly one CFC-500 chiller still operating in Malaysia, although this was not confirmed in this study.

Only one company, Dunham-Bush, was identified as manufacturing chillers in Malaysia. ACE Daikin, Carrier, Trane, York, McQuay (Sunworks Engineering) and Hitachi (Simetech) were all identified as being involved in importing and installing chillers.

4.1.5. Mobile Air-Conditioning (MAC) - Manufacturing

There are six major MAC manufacturers in Malaysia. These are Denso (M) Bhd., UCM Industrial Corporation (M) Bhd., APM Air Conditioning (M) Sdn. Bhd., Sanden International (M) Sdn. Bhd., Seasonair (M) Sdn. Bhd., and PATCO (M) Sdn. Bhd. Out of these six manufacturers, the first three have already completed their ODS phaseout projects with financial assistance from the Multilateral Fund. The Multilateral Fund has recently approved financial support of approximately $800,000 to support conversion at Sanden International. This project is expected to be completed by the end of 2002. The total financial support from the Multilateral Fund for the CFC phaseout in the MAC sector in Malaysia is approximately $5.6 million.

PATCO had already converted in MAC production facilities to CFC-free technology since early 1997 without financial assistance from the Multilateral Fund. Therefore, Seasonair is the only remaining CFC MAC manufacturer in Malaysia.

It was considered that all new vehicles which have air-conditioning fitted at the factory are now CFC-free. There remains a number of vehicles still being fitted with new CFC-12 MAC systems by after-market agents. These are commercial vehicles (light trucks and passenger vans). The primary source of CFC-based components is the local manufacturer "Seasonair" which has not yet received assistance to convert its production. A specific project to assist Seasonair and to phase out the remaining CFC consumption in the MAC manufacturing sector is proposed.

Seasonair is a major manufacturer of fin-and-tube condensers for CFC MAC systems. MAC installation shops get their supply of condensers and evaporators from Seasonair. Other parts (e.g., compressors, hoses, receiver dryers) are imported or sourced locally from other suppliers.

With funding from the Multilateral Fund to support conversion at Seasonair, the Government of Malaysia agrees to prohibit any installations of CFC MAC systems in new commercial vehicle by the end of 2004. Supporting measures to ensure that no CFC MAC installation in commercial vehicles at MAC installation shops across the country will be put in place. These measures include mandatory inspection of MAC systems in all commercial vehicles.

The Government has recently written to all known car importers and manufacturers to warn them to stop fitting vehicles with CFC-12.

4.2. Refrigeration Servicing Sub-Sectors

4.2.1. Domestic and Commercial Refrigeration --Servicing

Data from the CFC importers and suppliers identified consumption of about 120 tons of CFC-12 in year 2000 of which all of them is used for servicing. In 2000, the imports of CFC-115 (as a pure substance) and of R-502 as a mixture were both zero which were a significant drop from past years when demand for R-502 was estimated at about 30 MT per year. This drop in imports is offset by imports from previous years.

The survey conducted under this study reveals that there are about 600 workshops dealing with domestic and commercial refrigeration equipment with only a few hundred specialised workshops in this field.

Because of the price difference between refrigerants there was reported to be widespread use of CFC-12 and R-502 to service refrigerated transport trucks fitted with HFC-134a and R404A refrigeration systems. The total demand for CFCs to service refrigerated transport vehicles was estimated to be less than 10 tons of CFC-12 and a similar amount of R-502 per year.

There are no shipping container manufacturing facilities in Malaysia and only limited facilities to service these. Most containers are maintained at the facilities in Singapore.

In addition, a small amount of CFC-11 may be used for "flushing", which is the cleaning out of mineral oil from compressors. No estimates of the scale of this use could be made and data from CFC-11 importers did not identify any users in the refrigeration service sector.

4.2.2. Chillers

According to information given by the chiller suppliers there are a minimum of 821 CFC chillers in Malaysia, installed at 394 sites nation-wide. Six hundred and twenty seven chiller units were identified as using CFC-11 (76%), while 194 units (24%) are operating with CFC-12 as the refrigerant. The chiller suppliers are reasonably confident that they have identified all of the chillers, although there may be a number of chillers installed in the 1970s or earlier which they are not aware of. The maximum number of chillers in Malaysia is less than 1,000.

The manufacturers estimated the chillers they have identified use 102 metric tons of CFCs per year for servicing. Of the 102 tons, 77.33 tons was CFC-11 and 25.35 tons was CFC-12. Few chillers have been decommissioned or converted since 1995 when the last CFC chillers were installed. As the lifetime of a chiller is at least 25 years, the demand for CFCs in this sector is expected to decline only slowly as older buildings and chillers are replaced (unless other policies or practices change).

4.2.3. MAC –Servicing

In 2000 the use of CFCs in MAC servicing industry was by far the largest user of CFCs in Malaysia. It is extremely difficult to identify the exact consumption of CFCs in this sector due to the very large number of end users and the many layers of distributors.

Malaysia began the change from CFC-12 to HFC-134a in new vehicle MACs in 1995 with the bulk of vehicle models converted to HFC-134a by 1997. However, because of the economic crisis, a small number of 1997 and 1998 model year vehicles continued to be produced with CFC-12 systems fitted at the factory as late as 1999.

Based on the statistical data provided by Department of Transport, there were 3.2 million vehicles in Malaysia fitted with CFC MACs in 2000. During the National CFC Phase-out study, a survey was carried out for 400 MAC service shops and the results suggested that the average charge size for all vehicles was 0.96 kilogram and that the equivalent of a full charge is replaced every two and half years. Using this data, the demand for CFC-12 in the MAC sector in 2000 is estimated to be 1,212 tons (Table 4.11).

Table 4.11 Calculated CFC demand for MACs

Number of vehicles on road with CFC-12 MAC (million) in 2000	3.155
Average charge size (kilogram)	0.96
Number of years per complete recharge	2.5
Total amount of CFC-12 expected to be consumed (MT)	**1,212**

Source Department of Transport and NCFCP survey

Using these assumptions and data from Department of Transport on annual vehicle registrations it is possible to estimate the demand for CFC-12 for servicing MAC until 2010 as shown in Table 4.12.

Table 4.12 Demand for CFC-12 to service MACs 2000 – 2010

Year	**Number of vehicles on road with CFC MACs**	**Demand for CFC-12 to service vehicles still in operation (MT)**
2000	3,155,429	1,212
2001	3,018,052	1,156
2002	2,880,676	1,100
2003	2,743,299	1,045
2004	2,605,923	1,001
2005	2,468,546	989
2006	2,331,170	878

2007	2,259,573	823
2008	2,168,788	768
2009	2,031,351	713
2010	1,845,142	659

Based on 20 year vehicle life, and average charge of 0.96 kilogram per 2.5 years

None of these calculations however make any allowances for the use of CFC-12 to service HFC-134a systems (backwards retrofits). Results of the survey reported that 13% of respondents had topped up HFC-134a systems with CFC-12 and 19% had used CFC-12 in HFC-134a MAC systems during servicing. These are thought to be minimum figures as the sample was skewed towards larger workshops and national chains. A recent sample of 10 vehicles at one workshop in the KL region found that 9 of the 10 vehicles which had HFC-134a MACs fitted had some amounts of CFC in their systems.

The actual demand for CFCs in the MAC servicing sector, including that used for backwards retrofits is considered to be in the range of 1,200-1,400 MT of CFC-12 in 2000. The National CFC Phase-out Plan has adopted a figure of 1,300 MT for the consumption in MAC sector in year 2000 and this figure has been cross checked with data derived from vehicle fleet populations (Table 4.12) and from sales of MAC components.

Based on the result of the MAC survey, it is reported that a significant amount of CFC-12 is used each year for "topping up" vehicles. The remaining CFC is used during servicing of vehicles where systems are actually worked on before refilling. It was also estimated that all new buses and trains are fitted with non-CFC refrigerants in their air-conditioning units although there is anecdotal evidence that many of the HFC-134a busses are serviced with CFC-12 once their warranty expires. In Malaysia, there are about 35,000 busses fitted with CFC-12 MACs. It is estimated that these consume a maximum of 300 MT of the 1,300 MT of CFC used in the MAC sector per year.

The importers estimated the number of actual workshops was closer to 3,000. The survey of MAC workshops carried out as part of the NCFCP process reported that the average amount of CFC consumed by each workshop was 36 kilogram per month per workshop. If the sector consumption is taken to be 1,300 MT per year, then this would represent the consumption of 3,009 workshops. This confirmed the estimate made by chemical importers.

5. OTHER USES

There are a small number of uses of CFCs in Malaysia which are not covered in the previous sections. These include certain testing procedures and the sterilization of medical equipment. These "other uses" are negligible consumers of CFCs, but they can be important to the users.

The Police are known to have used CFC-113 as a solvent for some special tasks such as testing for fingerprints. There is also known to be a small (less than 100 kilogram of

CFC-113 per year) use of CFCs for analytical testing at the Chemistry Department of the Ministry of Science, Technology and the Environment. This department carries out all laboratory analyses for government departments including those for prosecution/legal cases. There is no legal obligation on the Malaysian police or the Chemistry Department to stop their use of CFC for these purposes.

The study did not identify any medical facilities using CFC-11 as part of their sterilization procedures.

No uses of carbon tetrachloride were identified. It was reported that the Chemistry Department and possibly some research universities may use very small amounts, but no users could be identified. For the last three years imports have been either zero or a few hundred kilograms. In 2000 official records show one shipment of 11.5 MT of carbon tetrachloride was imported into Malaysia.

The Government plans to:

(a) Create an exemption mechanism to allow for the import of these substances (CTC and 1,1,1-TCA) for internationally exempted uses i.e. for "laboratory and analytical uses".

(b) Seek bilateral assistance from the Government of Sweden to carry out intensive survey and develop a comprehensive strategy for complete phaseout of 1,1,1-TCA and CTC.

(c) Inform all testing laboratories, the armed forces, and the Malaysian Police about the possible future shortage of supply of CFC-113 and provide information on international efforts to phase out these uses.

(d) Inform all medical facilities of possible future shortages of supply of CFC-11.

CHAPTER 5
NATIONAL CFC PHASE-OUT PLAN

1. INTRODUCTION

As mentioned in Chapter 1, to comply with the Montreal Protocol, Malaysia must freeze its consumption of the Annex A CFCs at 3,271 ODP tons by 2000 and then reduce this to 1,635 ODP tons by 2005 and 491 ODP tons by 2007, before complete phase-out in 2010.

The study showed that without further action taken by the Government and without additional intervention from the Multilateral Fund, Malaysia will probably meet its 50% reduction target for Annex A, Group I chemicals in 2005. This conclusion is based on the assumptions that (i) no enterprises that have already been converted to non-CFC technology will revert to CFCs; (ii) illegal imports are not suppressing legitimate imports; and (iii) idle manufacturing capacity remains idle. With regard to meeting the 85% reduction target in 2007, Malaysia will have to phase out an additional 820 MT of Annex A, Group I chemicals from the current trends in consumption. As Chapter 1 has shown, the progress made by Malaysia in ODS consumption phase-out can be easily erased if no steps are taken in the critical years of the compliance period.

While the focus of the National CFC Phase-out Plan is to phase out Annex A, Group I chemicals, consideration was also made to reduce the consumption of Annex B chemicals. Phase out of Annex A, Group II chemicals is not addressed in this study as the phase out of these chemicals (halons) is being done via a separate non-investment project (Malaysia Halon Bank).

2. PROPOSED POLICIES AND STRATEGIES

It is the Malaysian Government policy to meet the MP obligations while reducing the potential negative impacts on the country. Recognizing these commitments, the Government plans to phase out the remaining CFC-uses in the manufacturing sector before 2005 by applying a series of phase out targets that will be implemented through existing controls and new regulations issued under the Environmental Quality Act 1974. In particular, the Government intends to impose ban on the use of CFCs and ODS solvents in the manufacturing sector by January 2005, and to establish legal requirements to pre-empt back-conversion of non-CFC equipment as soon as possible. The latter is critical to the success of sustainable phase-out of CFCs in the servicing sector.

Based on the survey results, the total use of Annex A, Group I chemicals in enterprises in the manufacturing sector that are eligible but have not received any assistance from the Multilateral Fund is about 167 MT. The Malaysian Government is seeking funding from the Multilateral Fund to support conversion at these enterprises. The Government plans to have conversions of these enterprises completed by the end of 2004. The Government plans to ban the use of Annex A, Group I chemicals for the manufacturing sector by 1

January 2005. This will lead to additional phaseout of 184 ODP tons (of which, 167 ODP tons is phased out through the MLF support) of Annex A, Group I chemicals.

With the whole manufacturing sector eventually becoming CFC-free, the amount of Annex A, Group I chemicals to be imported from 2005 onwards will be for meeting the demand in the servicing sector only. To meet the 85% reduction target in 2007, an additional CFC phase-out of about 636 MT, in addition to CFC reduction from attrition of existing CFC equipment, must be accomplished within the next five years (from 2002 – 2006).

To reduce the demand of CFCs in the servicing sector, particularly in the MAC sub-sector, the Government plans to establish a regulatory system to prevent the use of CFCs in non-CFC MAC systems. The Government is also contemplating regulatory requirements to ban the use of CFC in all MAC and AC systems and other refrigeration systems by 2010.

As part of the National CFC Phase-out Plan, a series of policies and regulations banning the use of CFC in the manufacturing sector will be issued by the end of 2003 in order to ensure sustainability of CFC phase-out in the manufacturing sector. The proposed bans will become effective from 1 January 2005. DOE will use the existing legislations: the AP system and the Environmental Quality Act, as its major legal tools to ensure sustainable phase-out of CFCs.

3. IMPACT OF APPROVED PROJECTS AND NEWLY PROPOSED ACTIVITIES

Impact of various investment, technical assistance, and regulatory activities proposed under this National CFC Phaseout Plan is shown in Tables 5.1 to 5.5. In 2000, Malaysia imported 1,979 ODP tons (1,982 MT) of Annex A, Group I chemicals. The survey conducted during the preparation of this plan determined that the total amount of all CFCs actually consumed by end-consumers is about the same as the amount imported. However, when comparing the amounts imported and consumed for each chemical, there are slight differences in the amounts of CFC-11 and CFC-12 imported and the amounts consumed in the same year. This difference could have arisen from the fact that not all imported CFCs are consumed within the same year. When calculating the impact of the interventions proposed in the National CFC Phase-out Plan, the identifiable consumption will be used as a basis of the analysis.

With no further intervention from the Multilateral Fund or from the Government, it is expected that the current consumption level of 2,092 ODP tons a year will decrease by 676 ODP tons in 2004 due to the completion of all remaining investment projects already approved by the Executive Committee of the Multilateral Fund and other supporting measures carried out by the Government.

At present, there are 10 on-going foam projects with a total CFC-11 consumption of 183.1 ODP tons. These projects are scheduled to complete in 2001 – 2004. The impact

of these projects would begin to be realized from 2002 onwards. The demand for CFC-11 in the foam sector will decrease by 27 ODP tons in 2002, 86 ODP tons in 2003 and 183.1 ODP tons in 2004.

In the refrigeration sector, there are five on-going investment projects which are scheduled to be completed no later than 2004. Therefore, the full impact of these projects, reduction of CFC-11 demand by 129 ODP tons, CFC-12 by 33 ODP tons and CFC-115 by 0.3 ODP tons, will be realized by 2004.

The MAC recovery and recycling demonstration project had been completed before 2001. Its full impact has already been realized. The on-going recovery and recycle facilities for the chiller sub-sector (MASHRAE project) would result in an additional reduction of 77 ODP tons of CFC-11. The impact of this project will be realized in 2005.

Based on the industrial survey, it is estimated that in 2000 there is an existing stock of 3.6 million CFC-12 domestic refrigerators installed across the country, as Malaysia has stopped production and import of CFC-12 domestic refrigerators since 1997. With a life expectancy of 20 years for domestic refrigerators, it is expected that all CFC-12 domestic refrigerators will be retired by 2016. That means from 2010 onwards when Malaysia is no longer allowed to import any more CFCs, there will still be some CFC-12 domestic refrigerators that may require CFC for servicing.

It is estimated that during the period from 2010 – 2016, there may be about 120,000 CFC-12 domestic refrigerators that need servicing. However, early retirement of these units can be avoided through the refrigeration service technicians training programs. The CFC demand for servicing these units can be replaced through retrofitting. No compensation for retrofit is requested under this plan.

As the life expectancy of commercial refrigerators is about seven years and the current production level of about 150,000 units of non-standard commercial refrigerators, there are about one million commercial refrigerators installed across the country. The survey indicates that about 120 ODP tons of CFC-12 are being used for servicing CFC-12 refrigerators. Since the Government of Malaysia agrees to ban the use of CFCs in the production of commercial refrigerators after 2004, the demand for CFC-12 in this sector will, therefore, start to decline from 2004 onwards.

The refrigerated transport sub-sector consumed 10 MT of CFC-12 and 10 MT of R-502 in 2000. Since there is no production of CFC refrigerated transport in Malaysia, it is expected that the demand for CFCs in this sub-sector will gradually decline over the next ten years. At the time the survey was conducted, it was reported that most CFCs refrigeration transports were more than 10 years old. Therefore, it is expected that by 2010 all these units will be retired.

The impact of the proposed strategy for the MAC sector can be described as follows. First, a condition will be imposed that commercial vehicles manufactured from 1 January 2004 will not have their registrations renewed if their MACs contain CFC as refrigerant.

(All MAC manufacturers will complete their conversion by the end of 2003.) This will discourage reverse retrofit of HFC-134a MACs and help prevent the demand of CFC-12 in this sector from increasing.

As the average life expectancy of vehicles is about 20 years, it is expected that by 2016 most vehicles that were equipped originally with CFC MACs will be retired. It is recognized that within the life span of the vehicles, vehicles' owners may need to have their MACs repaired. It is, however, expected that most owners of vehicles with CFC-12 MACs will replace the old CFC-12 units with another new or rebuilt CFC-12 unit.

By 2010, it is estimated there will still be about 1.8 million vehicles that were manufactured before 1996 and originally equipped with CFC-12 MACs in operation. However, with other supporting activities, including legal pressure created by a MAC annual inspection as discussed in the subsequent chapter, many owners of vehicles will replace their CFC-12 MACs with non-CFC systems when their original systems break down. The actual impact of early retirement of CFC-12 MACs is expected to be much less than 1.8 million units.

The training program to be provided to service technicians is expected to help minimize the current practice of topping up refrigerant without fixing the leak. The current rate of topping-up is about 34%. The training program is expected to reduce topping up by almost 300 ODP tons a year.

The National CFC Phase-out Plan also proposes new investment activities in the manufacturing sectors in the foam, solvent, refrigeration and MAC manufacturing and servicing sectors. New investment activities will result in an additional reduction of 184 ODP tons.

In addition to all the interventions mentioned above, CFC phase-out of an additional 120 ODP tons is still required in order to meet the 85% reduction target in 2007. It is proposed that a MAC recovery and recycling option be employed.

With the proposed plan, Malaysia will be able to meet its 50% and 85% reduction targets in 2005 and 2007. In 2010, there will still be a demand for CFC-12 of approximately 262 ODP tons. This demand represents a large number of MACs and domestic refrigerators that have to be retired before the end of their useful life. However, with the train-the-trainer programs and certification programs included in this plan, Malaysia will have infrastructure and service technicians that are capable of converting these equipment items to other non-CFC alternatives.

To ensure that the phase-out in the manufacturing sector is permanent, the Government of Malaysia plans to use the AP system to prohibit the import of all CFCs except for the amounts of CFC-11, CFC-12 and R-502 needed to service the existing stock of equipment from 1 January 2005. While there is no complete phaseout schedule proposed for 1,1,1-TCA and CTC in this plan, the Government of Malaysia considers development of a comprehensive strategy for phaseout of 1,1,1-TCA and CTC as a high priority action. It will request bilateral assistance from the Government of Sweden to carry out a

market survey for these two chemicals and formulate a phaseout strategy for these two chemicals as soon as possible. The strategy will also cover the need for establishment of an exemption mechanism for the specialized use of 1,1,1-TCA and CTC. In the meantime, the Government of Malaysia agrees to reduce the import quota for 1,1,1-TCA from 2005 onwards to 180 MT.

Table 5.1. CFC Phaseout by On-going and Newly Proposed Activities (MT)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CFC-11 (Demand)	587	587	587	587	587	587	587	587	587	587	587
Impact of On-going Phaseout Activities											
Completion of On-going Projects: Foam		22	27	86	183	183	183	183	183	183	183
Completion of On-going Projects: Comm. Ref.		-	42	53	129	129	129	129	129	129	129
Completion of On-going Projects: Aerosol						20	20	20	20	20	20
Full Operation of MASHRAE Project		15	30	45	60	77	77	77	77	77	77
Impact of New Phaseout Activities											
Investment Activities in the Comm. Ref. Sector					-	10	10	10	10	10	10
Investment Activities in the Foam Sector					-	151	151	151	151	151	151
Additional reduction from ineligible foam enterprises					-	17	17	17	17	17	17
CFC-11 Reduction Schedule	587	550	488	403	215	0	0	0	0	0	0
CFC-12 (Demand)	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490
Impact of On-going Phaseout Activities											
Completion of On-going Projects: Comm. Ref.		-	2	9	33	33	33	33	33	33	33
Chiller Replacement/Retirement		1	2	3	4	5	5	6	7	8	9
Retirement of CFC-12 Domestic/Commercial Refrigerators		10	20	30	40	50	60	70	80	90	100
Retirement of CFC-12 Refrigerated Containers		1	2	3	4	5	6	7	8	9	10
Retirement of Vehicles with CFC-12 MACs	-	56	112	167	223	279	334	389	444	499	553
Impact of New Phaseout Activities											
Investment Activities in the Comm. Ref. Sector					0	2.16	2.16	2.16	2.16	2.16	2.16
New Vehicle Inspection Requirement Upgrading Capacity of Inspection Stations					20	40	60	80	100	100	100
Train-the-Trainer Program Certification of MAC Service Technicians (No Top-Up) Revolving Fund to Finance Procurement of MACs Maintenance Tools				100	200	300	300	300	300	300	300
Revolving Fund for R&R Machines				30	60	90	120	120	120	120	120
CFC-12 Reduction Schedule	1,490	1,422	1,353	1,148	906	687	570	483	396	329	262
CFC-113 (Demand)	3	3	3	3	3	3	3	3	3	3	3
Impact of New Phaseout Activities											
Investment Activities in the Solvent Cleaning Sector						3	3	3	3	3	3
CFC-113 Reduction Schedule	3	3	3	3	3	0	0	0	0	0	0
CFC-114 Reduction Schedule	-	-	-	-	-	-	-	-	-	-	-
CFC-115 (Demand)	21	21	21	21	21	21	21	21	21	21	21
Impact of On-going Phaseout Activities											
Investment Activities in the Comm. Ref. Sector			0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Retirement of R-502 Cold Stores							3.00	6.00	9.00	12.00	15.00

Retirement of R-502 Refrigerated Containers							1.00	2.00	3.00	4.00	5.00
Impact of New Phaseout Activities											
Investment Activities in the Comm. Ref. Sector						0.50	0.50	0.50	0.50	0.50	0.50
CFC-115 Reduction Schedule	20.80	20.80	20.50	20.50	20.50	20.00	16.00	12.00	8.00	4.00	-

Table 5.2. CFC Phaseout Schedule Based on the Proposed Plan

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Phaseout Schedule for Malaysia (ODP tons)	2,092	1,987	1,855	1,566	1,136	699	579	490	401	332	-
Interim Reduction Targets for Malaysia (ODP tons)	3,271	3,271	3,271	3,271	3,271	1,635	1,635	491	491	491	-
Required Additional Phaseout Activities (ODP tons)	-	-	-	-	-	-	-	-	-	-	-

With no more R&R machines, Malaysia will exceed the 85% reduction target in 2007 by 120 MT.
To have additional phaseout of 120 MT, additional 350 R&R machines must be in operation by 2007.

Table 5.3. CTC Phaseout Schedule (MT)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
CTC (Demand)*	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
CTC Reduction Schedule	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5

* 11.5 MT of CTC was reported to be imported in 2000. However, no consumption was found.
Remark: Import data of CTC is as follow: 320 kg in 1997; 800 kg in 1998; 0 kg in 1999; 11.5 MT in 2000.

Table 5.4. 1,1,1-TCA Phaseout by On-going and Newly Proposed Activities (MT)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
1,1,1-TCA (Demand)*	510	510	510	510	510	510	510	510	510	510	510
Impact of New Phaseout Activities											
Ban the use of 1,1,1-TCA in the manufacturing sector where users have alternatives			-	-	-	185	185	185	185	185	185
Additional reduction through the AP system				33	33						
Investment Activities Metal Cleaning						146	146	146	146	146	146
1,1,1-TCA Reduction Schedule	510	510	510	477	477	180	180	180	180	180	180

Table 5.5. 1,1,1-TCA Phaseout Schedule Based on the Proposed Plan (ODP Tons)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Phaseout Schedule for Malaysia	51	51	51	48	48	18	18	18	18	18	18

Interim Reduction Targets for Malaysia				48	48	33	33	33	33	33	14
Required Additional Phaseout Activities				-	-	-	-	-	-	-	4

CHAPTER 6
ACTION PLAN

The action plan comprises activities to be carried out under the National CFC Phase-out Program in order to enable Malaysia to completely phase-out the use of CFCs in the country in line with the MP obligations. The proposed plan entails investment, technical assistance, and regulatory actions for the aerosol, solvent, foam, and refrigeration sectors of which the latter accountable for more than 82% of the current CFC use. DOE will be the lead-executing agency of the action plan in close co-operation with other key agencies concerned and with assistance from consultants. The action plan also includes a capacity building program to ensure adequate capacity of the enterprise and the executing agencies. Detailed activities are discussed below.

1. AEROSOL SECTOR

At the end of 2000 there are no companies that continue to manufacture aerosols that use CFCs as propellants. There may still be a quantity of CFC-11, estimated to be less than 20 tonnes, that is being used as a solvent.

1.1. INVESTMENT COMPONENT

A UNDP Umbrella Phase-out program is already in place in Malaysia dealing with 22 identified companies. If any further users of CFCs in this sector are identified they will be able to receive assistance from the UNDP project.

No additional funds are sought for this sector.

1.2. TECHNICAL ASSISTANCE COMPONENT

Even though the use of CFC in MDIs is currently exempted under the Montreal Protocol, Malaysia has taken proactive steps to reduce their usage. According to the document "Malaysia's Policy and Strategy on Metered Dose Inhalers (MDIs)" the Government wishes to move forward in tandem with the proposed transition in developed countries and has set the year 2005 as its target for transition to CFC-free MDIs.

Six non-CFC MDIs has already been registered in Malaysia although not all have been released onto the market. Aside from the Government's strategy, the driving force for the introduction of the non-CFC alternatives is mainly due to the corporate environmental policies of the MDI manufacturers in developed countries. As in most other countries, it was reported that non-CFC MDIs were not well received by current asthma patients as non-CFC MDIs have different taste and a different cooling effect.

Discussions with the Malaysian Pharmaceutical Control Bureau suggested that to successfully introduce non-CFC MDIs the Government's strategy should focus on educating medical doctors who are prescribing these products. Much of this education campaign can and will be paid for by the companies providing the alternative drugs, but

much will need to be done by the Government to avoid possible health impacts to the sensitive population.

Funding level. DOE will work with the pharmaceutical industries to increase awareness of the affected population on the transition to CFC free MDIs and to promote the use of CFC-free alternatives. DOE will also work with Ministry of Health and, where appropriate, suppliers to educate the medical doctors and to promote the use of CFC-free alternatives. The activities would be commenced as soon as possible. Financial support from the MLF has been estimated to be about US$57,200 (Table 6.1)

Table 6.1 Technical Assistance Component for MDIs

Description	US $
Workshops	25,000
Consultant Fees	15,000
Information Dissemination Materials for Health Care Industry	12,000
Sub-total	52,000
Contingency 10%	5,200
Total	**57,200**

1.3. REGULATORY COMPONENT

In Malaysia, the Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993 prohibits the use of CFCs in aerosols industry, but has allowed a "grace period" for companies so they can complete investment projects. The Government will enforce the regulations by 1 January 2005.

DOE will publicise the existing regulations, especially among companies likely to purchase solvent based aerosols and will disseminate information through various media to increase awareness and cooperation of the private and the public. A series of training to Government staff will be carried out to ensure effective monitoring and enforcement of the compliance.

All the activities will be completed by the end of 2004. No funding request is being sought for this activity.

2. SOLVENT SECTOR

At present there are no regulations controlling the use or sale of ODS solvents in Malaysia. Those in the solvents industry generally agree that there are alternatives available to replace all uses of ODS solvents. However, no one product has the same properties as 1,1,1-TCA or CFC-113. Many companies continue to use ODS solvents because they are cheaper. It is clear that while it remains legal to use these substances, companies will continue to do so. Some companies have raised concerns over the

flammability and in some cases, toxicity of the replacements but this appeared to be much less of a concern than price. To phase-out the remaining use of ODS solvents will require a combination of regulations and financial assistance for those remaining industries that have not yet received assistance to convert.

The Government plans to phase-out all known uses of CFC-113 in Malaysia by the end of 2004.

2.1. INVESTMENT COMPONENT

(a) CFC-113

Recipients and funding level. The survey identified two companies that are still using CFC-113 as a solvent and are eligible for assistance from the MLF. These companies used a total of 3.15 MT (2.52 ODP tons) of CFC-113, and accounted for most of the ongoing demand for CFC-113. The Government would like to request a fund of US$49,720 from the MLF to support the conversion processes of these eligible companies (Table 6.2). The funding level is based on the cost effectiveness threshold of $19.73 / kg ODP established by the ExCom.

Table 6.2 Companies using CFC-113 in Malaysia that are eligible for assistance

Enterprise	Type of ODS	Consumption (ODP Tons)	Requested Funding (US$)
1. Airod	CFC-113	0.12	2,370
2. Aksijasa Supply and Service	CFC-113	2.4	47,350
Total		**2.52**	**49,720**

Funding mechanism. DOE will invite all remaining users of CFC-113 in the manufacturing sector to submit their applications for financial support to phase out CFC-113. In case there are additional enterprises that are not included in the above table and wish to receive financial assistance, the phase out costs of these additional enterprises will be covered by the above requested amount.

DOE will invite the above enterprises and any other remaining users of CFC-113 in the solvent sector to submit their phaseout proposals for financial assistance. Proposals must be submitted to DOE not later than the end of 2003. Proposals must include a list of new equipment items and safety devices, a specific completion date, and a plan and method to render the old equipment unusable. When converting to alternatives, enterprises are required to comply with other relevant environmental protection regulations in the country. All conversion projects must have a completion date not later than the end of 2004.

(b) 1,1,1-TCA

Recipients and funding level. Twenty companies were identified as using 1,1,1-TCA as a solvent, which have not previously received assistance from the MLF. These companies used a total of 330.56 MT of 1,1,1-TCA and accounted for most of the ongoing demand. Of the twenty companies only thirteen are eligible for assistance under the ExCom guidelines and about 145.9 MT (14.59 ODP tons) of 1,1,1-TCA were used in 2000 (Table 6.3). The remaining companies that continue to use 1,1,1-TCA as a solvent are all either foreign owned, recently established or already recipients of the MLF.

Table 6.3 Companies using 1,1,1-TCA in Malaysia that are eligible for assistance

Organisation/ Company	Quantity (ODP tons)	Requested Funding (US$)
1. Malayawata	0.3	11,550
2. CCM Fertilisers	0.4	15,400
3. Percetakan Keselamatan Nasional Sdn Bhd	2.27	87,400
4. E.M I Embroidery Sdn Bhd	0.005	190
5. Trans Pacific Industry Sdn Bhd	0.33	12,700
6. Airod Sdn Bhd	0.1	3,850
7. Kofa Chemical Works (M) Sdn Bhd	0.47	18,100
8. Milliontex Industries (M) Sdn Bhd	0.04	1,540
9. Unasco	0.1	3,850
10. Aksijasa Supply and Services Sdn Bhd	0.3	11,550
11. Excellent Chrometech	0.32	12,320
12. Malaysian Oxigen	1.58	60,830
13. Seasonair	8.37	322,250
Total	**14.59**	**561,530**

As the remaining users of 1,1,1-TCA are small- and medium-scale enterprises, the Government of Malaysia would, therefore, like to request the Multilateral Fund to provide financial support at the cost-effectiveness threshold of $38.50 /kg ODP. Therefore, the total funding request to support phaseout activities in this sub-sector is $561,530.

Funding mechanism. This would be similar to that of CFC-113 described above. DOE will invite enterprises to submit phaseout proposals for DOE's consideration of financial assistance. Proposals should be submitted to DOE not later than the end of 2003. Proposals must include a list of new equipment items and safety devices, a specific completion date, and a plan and method to render the old equipment unusable. When converting to alternatives, enterprises are required to comply with other relevant environmental protection regulations in the country. All conversion projects must have a completion date not later than the end of 2004.

With the above, Malaysia will be able to eliminate 330.56 MT of 1,1,1-TCA. The remaining use of 195 MT is believed to be in SMEs. To enable the Government of Malaysia to complete phase out this remaining use, DOE will seek bilateral support from the Government of Sweden to develop a comprehensive strategy to phase out this remaining use. Funding request for this bilateral support will be submitted separately.

(c) Carbon tetrachloride (CTC)

No users for CTC were identified by this study. To enable the Government of Malaysia to meet all the obligations for CTC, it is proposed that a technical assistance program to identify the remaining use of CTC as well as to develop a list of exempted applications. Malaysia will seek bilateral support from the Government of Sweden to identify all laboratory uses and other uses of CTC in Malaysia. Based on the list of end-users, Malaysia will develop a list of exempted applications in line with exemptions that the Montreal Protocol has already provided to non-Article 5 countries. Funding for this component will be submitted separately by the Government of Malaysia and the Government of Sweden, at a later date.

2.2. REGULATORY COMPONENT

At present there are no regulations controlling the use or sale of ODS solvents (CFC-113, CTC and 1,1,1-TCA) in Malaysia. By the end of 2004, the Government will prohibit the import, use, and sale of CFC-113.

For 1,1,1-TCA and CTC, the Government will set up an exemption mechanism for applications that have not been identified under this study. Exemption may be given however to some companies which meet criteria to be developed by the Government, including those uses exempted by the Montreal Protocol such as "laboratory and analytical uses".

By 1 January 2005, the Government will prohibit the use of 1,1,1-TCA and CTC in the manufacturing sector, except 1,1,1-TCA used in exempted applications. To ensure full compliance with the freeze level on 1 January 2003, the import quota from 2002 to 2004 will be set at 477 MT. The import quota for 1,1,1-TCA for 2005 onwards will be reduced to 180 MT while the import quota for CTC will be maintained at the 11.5 MT level until further study for 1,1,1-TCA and CTC proposed above is concluded, but before 2005.

3. FOAM SECTOR

3.1. INVESTMENT COMPONENT

Recipients and funding level. Using information from polyol suppliers, the study identified 32 eligible companies that meet criteria for MLF assistance. There are other companies that are still using CFCs but they are not eligible for assistance as they are either foreign owned, established after 1996, or already recipients of support from the MLF. The 32

eligible enterprises consumed a total of 150.8 MT of CFC-11 in 2000 and of these companies, only 7 consumed more than 10 tons in 2000.

Table 6.4 Companies using CFC-11 in the foam sector that are eligible for assistance

Organisation/ Company	**Sub-sector**	**CFC-11 Consumption (ODP Tons)**
1. Ban Eng Hong Ref.	Insulation Foam	1.5
2. NKR Continental Mfg Sdn Bhd	Insulation Foam	0.25
3. Fibtra Haiman S/B	Insulation Foam	0.25
4. OM Sri Bumi Eng.	Insulation Foam	0.3
5. American Int. Ind. Technologies (M) S/B	Insulation Foam	3
6. Power Insulation Eng.	Insulation Foam	0.3
Subtotal		**5.6**
7. Premium Polyurethane Technology (M) Sdn Bhd	Rigid PU – Panels	6
8. Flomac Engineering S/B	Rigid PU – Panels	0.125
9. NCL Industries Sdn Bhd	Rigid PU – Panels	19.2
10. Boon Koon Vehicles Ind.	Rigid PU – Panels	2
11. Accord Landscape	Rigid PU – Panels	0.25
12. Chan Boat Yard Ent.	Rigid PU – Panels	1.5
13. Tan Cheng Hong & Sons	Rigid PU – Panels	0.3
14. Pacific Engineering	Rigid PU – Panels	0.6
15. Polychem Insulation	Rigid PU – Panels	0.75
16. Rotomas Tech.	Rigid PU – Panels	0.5
17. SEP Engineering	Rigid PU – Panels	0.3
18. Supiera Enterprise Sdn Bhd	Rigid PU – Panels	5.1
Subtotal		**36.6**
19. HL Motor Sdn Bhd	Flexible Foam	4.5
20. Paragon Car Carpet Sdn Bhd	Flexible Foam	15
21. Oriental Summit Indus.	Flexible Foam	15
22. Rokisar Sdn Bhd	Flexible Foam	10
23. Spurs Indus. (M) S/B	Flexible Foam	2
24. Hippo Indus. S/B	Flexible Foam	1
25. Natural Rubber Foam	Flexible Foam	4.3
26. Selesa Foam Marketing	Flexible Foam	11
27. Wing Fatt Hing Mfg S/B	Flexible Foam	12
Subtotal		**74.8**
28. Ngui Soon Fatt Eng. S/B	Multisector (Flexible Foam and Integral Skin Foam)	11
29. Malaysia Olefins		6.9
30. Top Amity		13
Subtotal		**30.9**
31. Kim Gay Fibre Crafting	Integral Skin Foam	0.64

32. Moccis Furniture S/B	Integral Skin Foam	2.25
Subtotal		**2.9**
Total		**150.8**

The Government plans to phase out the remaining consumption of 150.8 ODP tons of CFC-11 used by the eligible companies in the foam sector by converting all of them to non-CFC alternatives and would like to request a fund of US$1.42 million from the MLF. The funding level is calculated based on the ODP tons consumed by the remaining eligible enterprises and the average cost-effectiveness levels of foam projects in relevant foam sub-sectors that were previously approved for Malaysia. All of these foam enterprises meet the conditions of being small- and medium-scale enterprises established by the ExCom (Dec. 25/56). Accordingly 150% of the average cost-effectiveness levels are used for determining the funding levels (Table 6.5).

Table 6.5 Requested Funding for Remaining Foam Enterprises for Malaysia

Sub-sector	ODP tons	Average C-E for Malaysia (US$/kg ODP)	Funding Request (US$)
Rigid Polyurethane Foam			
Large enterprises	19.2	$8.27	$158,780
SMEs	23.03	$12.41	$285,800
Flexible PU Foam			
Large enterprises			
SMEs	74.8	$9.12	$682,180
Integral Skin Foam			
Large enterprises			
SMEs	2.9	$13.77	$39,930
Multi-sector			
Large enterprises	24	$7.41	$177,840
SMEs	6.9	$11.12	$76,730
Total	**150.83**		**$1,421,260**

Funding mechanism. DOE will invite all foam enterprises that are still using CFCs in their foam production to submit proposals for financial assistance for conversion to non-CFC alternatives. Funding priority will be given to enterprises established before July 1995. All proposals must provide information pertaining to non-CFC alternatives, baseline equipment, and equipment disposal plans. All proposals must have conversion processes completed before the end of 2004 at the latest.

Enterprises will be invited to submit proposals to DOE, not later than the end of 2003, to convert their existing facilities to CFC-free technology. Proposals must include a list of new and old equipment items and safety devices, if any, and a specific completion date which cannot be later than December 2004. The conversion plan must include a plan and method to render the old equipment unusable.

DOE will also provide technical assistance to help foam enterprises prepare their proposals. It is anticipated that the financial assistance will be delivered through the existing polyol suppliers. If it is found later that there are more foam enterprises that need to convert their production processes, costs of conversion at these additional enterprises will be covered by the funds already approved for this national CFC phase out plan.

3.2. REGULATORY COMPONENT

Similar to aerosol sector, the Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993 also prohibits the use of CFC-11 in the foam industry and a grace period has been given. By 1 January 2005, the Government will enforce the regulations. A condition prohibiting the sales of CFC-11 for use as a blowing agent will be attached to the import licenses. All CFC-11 importers will be required to provide a list of end-users.

In addition, the Government will ban the use of CFC-11 in the production of pre-mixed CFC-11 polyol, and the import of pre-mixed CFC-11 polyol. A task force comprising of chemical importers, polyol suppliers, major foam producers, DOE, MITI, and Custom will be established. The main responsibility of this task force is to monitor distribution of CFCs and HCFC-141b in the foam sector. A list of foam enterprises that are buying only base polyol or polyol mixed with additives will be developed. With this list, DOE/MITI will then be able to approach each of these enterprises to verify the types of blowing agents used in their processes.

4. REFRIGERATION SECTOR

4.1. DOMESTIC AND COMMERCIAL REFRIGERATION MANUFACTURING SUB-SECTOR

In Malaysia, all manufacturing facilities for domestic refrigeration have been converted on non-CFC technologies. A small number of manufacturers and installation of new commercial refrigeration equipment continues to use CFCs as the refrigerants. These are all small operations and it is likely that there are still others of a similar scale which have not been identified by the national CFC phase out study. A combination of assistance to the remaining enterprises, enforcement of existing regulations and, if needed, new regulations will be required to phase out all remaining consumption in this sector by the end of 2004.

4.1.1. Investment Component

Recipients and funding level. The study identified four eligible companies still using CFCs in the production of commercial refrigeration equipment with a total consumption of 2.16 ODP tons of CFC-12, 0.31 ODP tons of CFC-115 and 0.03 ODP tons of HCFC-22 (or 1 MT of R-502) and 10 ODP tons of CFC-11 per year.

To phase out the remaining amount of CFC in this sub-sector, the Government plans to provide assistance to these small companies to convert to non-CFC alternatives and would like to request a fund of US$ 137,330 from the MLF. The funding level is calculated on the basis of the average cost-effectiveness ($11.22/kg ODP) of previously MLF approved projects for Malaysia.

Table 6.6 Eligible companies using CFCs in commercial refrigerator manufacturers in Malaysia

Enterprise	CFC-11 (MT)	CFC-12 (MT)	R-502 (MT)	Consumption (ODP Tons)	Requested Funding (US$)
1. Sykt Pan Asia	1	0.15	0.04	1.163	13,050
2. Perpaduan Insan	4	0.96	0.96	5.277	59,210
3. Ocean Parade	1	0.15		1.15	12,900
4. Kim Ref.	3.75	0.9		4.65	52,170
Total	9.75	2.16	1	**12.24**	**137,330**

Funding mechanism. DOE will invite all enterprises that are still using CFCs in their commercial production to submit proposals for financial assistance for conversion to non-CFC alternatives. Enterprises must submit their proposals to DOE not later than the end of 2003. Funding priority will be given to enterprises established before July 1995. All proposals must provide information pertaining to non-CFC alternatives, baseline equipment, and equipment disposal plans. All proposals must have conversion processes completed before the end of 2004 at the latest.

DOE will also provide technical assistance to help the enterprises prepare their proposals. If it is found later that there are more enterprises that need to convert their production processes, costs of conversion at these additional enterprises will be covered by the funds already approved for this national CFC phase out plan.

4.1.2. Regulatory Component

The Environmental Quality (Refrigerant Management) Regulations 1999 already prohibits the "use of CFCs as a refrigerant in any new installation of a building chiller or refrigeration system". Enforcement of this regulation however has not yet begun due to the need to provide more assistance to many SMEs. By 1 January 2005, the Government will enforce the regulations and monitor the compliance.

4.2. DOMESTIC AND COMMERCIAL REFRIGERATION SERVICE SUB-SECTOR

The servicing of existing domestic refrigerators is still carried out with CFC-12. Because most domestic refrigerators are serviced by commercial refrigeration companies, it is not considered necessary to address the domestic refrigeration service sector separately from the commercial refrigeration sector. Similarly, because the use of CFCs to service refrigerated transport and for shipping containers is also very small, no specific assistance

is proposed for these sectors, over and above that which is proposed for the sector as a whole. Only the chiller sector has sufficiently different issues to warrant being treated separately. The chiller sector is dealt with in the next section.

It is reported that the total amount of CFC-12 used for servicing the domestic refrigeration sector is 7 MT in 2000. The CFC-12 consumption in the commercial refrigeration service sector is 120 MT of CFC-12 and 30 MT of R-502 in 2000. For the transport refrigeration sector, it is reported that 10 MT of CFC-12 and 10 MT of R-502 are required for servicing exiting systems.

Most large cold storage facilities, especially those using R-502 have been converted to other refrigerants, most commonly to HCFC-22 and R404A. The remaining demand for CFCs is for the servicing of the stand-alone commercial refrigeration devices such as display cabinets and commercial freezers. These units have a mechanical life of between seven to ten years. Provided that all manufacture is to be phased out by the end of 2004, virtually all of these manufactured units will be CFC free in 2010. However, this scenario assumes that the new HFC-134a (and other non-CFC refrigerants) are not serviced with CFCs (i.e. reverse retrofits). As many of the CFC replacements require different skills to use them and different specific knowledge of correct procedures, technicians in this sector must be retrained in order to handle this transition process. DOE recognizes this and will work with national training providers to develop new courses that include information on new refrigerants, new lubricants and recovery and recycling.

The proposed strategy is to provide assistance to service companies to ensure they have the skills to manage the transition to non-CFC refrigerants. This will ensure that workers have the ability to successfully manage the transition to alternatives without significant adverse impact on the Malaysian economy.

This new training program would specifically include training in retrofitting equipment to non-CFC alternatives especially for domestic refrigerators. The National CFC Phaseout Plan proposes that as well as receiving further training, these workers or technicians would be able to purchase the equipment necessary to carry out servicing of non-CFC refrigeration systems and retrofits (such as vacuum pumps, pressure gauges and leak detectors) at a reduced price. These actions will ensure that any CFC equipment still in operation in 2010, can in fact be serviced properly.

4.2.1. Train-the-trainers program

A train-the-trainer program will be developed by international and local experts from domestic and commercial refrigerator manufactures and technical institutes. Training materials will be developed by using, to the extent possible, information already available in the country and materials already produced by UNEP. All training materials will be prepared in the local languages. The content of the training program should include how to properly repair CFC-12 and HFC-134a refrigeration systems, the need for proper labeling of all repaired units, and procedures for retrofitting CFC-12 refrigerators to non-

CFC alternatives. The duration for each train-the-trainer session should not be longer than 5 days.

Once training materials are available, DOE will invite potential training centers and technical institutes, including Government operated centers to submit a proposal to be "Authorized Training Centers" for this sub-component. Before submitting proposals, copies of training materials including the overall objectives of this project component will be given to all potential training centers.

Proposals submitted by training centers should provide information related to the competency of their staff members in charge of the training courses, descriptions of their existing facilities, proposed duration for its service technician training course (it should not be longer than 2 days), and how much they intend to charge service technicians. Based on this information, DOE will select 30 training centers across the country to be their authorized training centers for this sub-component.

The local experts who assist DOE in developing the training materials will carry out two five-days workshops to train 60 trainers, two from each of the 30 selected training centers. Training will include hand-on sessions. At the end of training, participants will be required to take an examination. Those who pass the examination will receive certificates from DOE. For those who fail they will be required to undertake make-up classes before certificates are given to them. The training centers will not receive basic equipment free of charge until all of their trainers have received certificates from DOE. The final training program will include training in all Malaysia's national languages, not just English.

After completion of each training course, the authorized training centers will be obliged to provide DOE with a list of all technicians who have passed their courses along with names and addresses of service shops that they are working with. DOE will develop a database containing names of the certified technicians and names and addresses of service shops and will publish names of the companies, which have qualified technicians, in news media as an incentive for participation.

It is proposed that each of the participating training centers would receive two sets of basic equipment for training such as pressure gauges, vacuum pumps, refrigerant charging cylinder, recovery and recycling machines, and leak detectors. The selected authorized training centers will use these equipment items for training and certifying service technicians for the next four years (2006- 2009).

Table 6.7 Train-the-Trainer Program in the Refrigeration Servicing Sector

Description	US $
Development and Production of Training Materials	$15,000
Training of trainers (2 five-days courses, 30 persons for each course) by local	$5,000

experts	
Basic Equipment for 30 Training Centres (2 sets each)*	$270,000
Sub-total	$290,000
Contingency 10%	$29,000
Total	**$319,000**

*Based on a standard cost of $4,500.

It will take at least 12 months to set up the above infrastructure.

4.2.2. Certification of Service Technicians

There are about 600 shops providing services for domestic and commercial. To reach out to this target group of more than 600 shops, DOE will conduct a public outreach program including articles in newsletters, trade magazines and radios. The objectives of the public outreach program are as follows:

- To inform service shops of the need to phase out CFCs;
- To inform service shops of the future plan of DOE to restrict the sales of CFCs only among those who have been trained on proper handling of CFCs;
- To inform service shops of the future import quotas of CFC-12;
- To provide service shops with information pertaining to how and where to obtain the training;
- To inform service shops of DOE's assistance to provide basic equipment (i.e. vacuum pumps, pressure gauges, and leak detectors) that is required for proper maintenance of HFC-134a refrigeration systems. Assistance in a form of a financial subsidy for the procurement of basic equipment will be given to the service shops at which at least one of their technicians has already received training from one of the authorized training centers.

At the same time, DOE will carry out a local shopping procurement process in order to identify qualified suppliers to provide basic equipment items for this project. Service shops that have at least one of their technicians trained and certified can contact one of the qualified suppliers in order to obtain the basic equipment. Qualified suppliers will ask for copies of training certificates, names of certified technicians, addresses and names of the service shops.

Prior to delivery of the products, qualified suppliers will provide this information to DOE. DOE will review this information against its database in order to verify whether technicians have indeed undergone proper training.

Lists of service shops with certified technicians and with basic equipment for proper maintenance of refrigeration systems will be given to chambers of commerce of respective states or provinces.

It is proposed that the train-the-trainer program starts in mid 2005, and training for service technicians should start from mid 2006.

4.2.3. Regulatory Component

The Government does not intend to use this training scheme to introduce a formal accreditation or licensing scheme designed to limit access to refrigerants to licensed/certified technicians at this time. It considers that this would be logistically difficult and too likely to promote the sale of CFCs on the black market where they are not controlled. It may reconsider this issue of certification once the majority of the technicians have been trained and registered with DOE.

No additional regulations are proposed for this sub-sector.

4.3. MOBILE AIR-CONDITIONING (MAC) – MANUFACTURING SUB-SECTOR

Although installation of new-CFC-12 air-conditioning at the assembly factory vehicles stopped prior to 1999, a number of vehicles intended for commercial use continue to have new-CFC-12 MAC systems fitted at the dealer level.

There remains one manufacturer of CFC-12 components (Seasonair) in Malaysia that has not converted their facility to manufacture HFC-134a components. This company is now the major supplier of CFC-12 heat exchangers for commercial vehicles. The ExCom decided at its Seventeenth Meeting that project proposals in the MAC sub-sector should emanate from the manufacturers of MAC units themselves, not the manufacturers of component parts (Dec. 17/6 para. 14 and 14b). Assisting this plant to convert its facility should remove the supply of CFC-12 components and therefore encourage the fitting of non-CFC systems.

The Government of Malaysia would like to request the ExCom to provide financial assistance to support conversion at Seasonair which is the last MAC project to be submitted to the ExCom for its assistance. Moreover, the Government of Malaysia will ban the installation of CFC MACs in commercial vehicles by the end of 2003. Starting from January 2004, no vehicle registrations will be given to any new commercial vehicles equipped with CFC MACs.

Seasonair produces 77,000 coils and condensers per year. Its current production capacity is 120,000 units per year. This capacity was installed before July 1995. About 21,000 coils and condensers were exported to Indonesia, Singapore, Lebanon, Egypt and United Arab Emirates, in 2000. The export volume represents less than 27% of the total production level.

Seasonair is requesting the Government of Malaysia to seek financial support from the Multilateral Fund to cover part of the conversion costs at its facility. Funding request is for modifying its existing condenser production line and for purchasing of a brazing furnace that is essential for the production of new parallel flow condensers for HFC-134a

MAC systems. While the total project cost is about $3.18 million, the enterprise is seeking funding based on the standard costs of similar equipment as previously approved by the ExCom to other MAC projects. Based on standard costs, the eligible financial assistance from the Multilateral Fund is approximately $1,259,940.

With the financial support from the Multilateral Fund, it is expected that the conversion process at Seasonair will be completed by the end of 2003.

4.4. MOBILE AIR-CONDITIONING (MAC) - SERVICE SUB-SECTOR

It is estimated that without any reverse retrofit of HFC-134a MAC systems to CFC-12, the current consumption of CFC-12 in the MAC sector for servicing 3.2 million vehicles with CFC-12 MACs, was about 1,300 MT in 2000. It is found that reverse retrofit of HFC-134a MAC system is becoming widespread. To ensure that the CFC demand in the MAC servicing sector will continue to decrease over time as old vehicles are put out of service every year, and no new demand of CFC-12 is being created by reverse retrofit, a strategy addressing vehicle owners, service shops and supply of CFC-12, must be developed.

4.4.1. Mandatory Requirement of MAC Inspection for Commercial Vehicles

The Government will introduce MAC testing requirements for vehicles. Under Malaysia law, only commercial vehicles, which make up around 20% of the fleet, have annual inspections. These tests are carried out by PUSPAKOM (Automobile Computerized Testing Centre). Because it is primarily the commercial vehicles that continue to have CFC-12 systems fitted, testing their compliance will be very effective to enforce the proposed ban on installation and should serve to deter other vehicles, especially taxis, from backwards retrofits.

In addition to the annual vehicle inspections, DOE has the power to pull over vehicles that are emitting black smoke and carry out testing of vehicles for exhaust emissions. These tests can be carried out any vehicles on the road. It is proposed that when DOE test the vehicle's exhaust, they should also test the MAC system.

It is proposed that starting from 1 January 2004 that the checks by both PUSPAKOM and DOE will be expanded to include inspection of MACs. Any commercial vehicle manufactured or registered from 2004 onwards will not pass the inspection if it is found that their MACs contain CFC refrigerant. For non-commercial vehicles, from 2004 onwards owners of the vehicles manufactured or registered from 2000 onwards will be fined if CFC is found in their MAC systems. The names of any workshops that carried out the last service will be reported to DOE. Action may be taken against workshops where repeated offences are reported. Those service shops and their certified technicians will have names of their shops and certified technicians deleted from DOE's database of certified shops and technicians. In addition, from 2016 no vehicles will pass an inspection if their MACs contain CFC refrigerant. The public will be informed of this policy by the end of 2003.

To implement the proposed requirement, PUSPAKOM facilities and DOE's mobile inspection vehicles must have capacity to identify different types of refrigerants contained in MAC systems. It is proposed that all inspection stations and DOE inspection vehicles be equipped with refrigerant identifiers. There are currently 31 PUSPAKOM inspection stations across Malaysia and 21 DOE offices each with one or two mobile inspection vehicles.

To increase technical capacity of the existing vehicle inspection network, it is proposed that a manual describing procedures for determining the type of refrigerant in MAC systems be developed. All PUSPAKOM inspection stations and DOE testing staff, will be invited to send technicians for a half-day training. It is proposed that ten training sessions should be organized: five in the Kuala Lumpur Metropolitan Area and another five for other regions in the country. At the conclusion of the training, each participant will be given a refrigerant identifier which can identify CFC-12, HFC-134a, and hydrocarbons.

The vehicle inspection stations should follow the new requirement related to MAC systems proposed above. The Department of Transport will monitor compliance of these inspection stations through its existing procedures for monitoring performance of the vehicle inspection stations.

To carry out this component, it is expected that the cost of development and production of the manual for inspecting MAC systems will be about $10,000. An additional amount of $10,000 is required for organizing training sessions for technicians from the 31 vehicle inspection stations and 21 DOE regional offices. For refrigerant identifiers, the budget of $156,000 ($1,500 per set, 31 stations*2 + 21 DOE offices * 2) will be required.

The Government will also requires that all vehicles have a sticker identifying the refrigerant type in the MAC unit and the workshop that last worked on the system. The sticker will also inform the owner that adding CFC-12 to a HFC-134a system is illegal and may harm the vehicle. Requiring all vehicles to have a sticker is a very effective method of educating the public and the technicians about the Government's regulations. Such stickers are common in developed countries. As well as informing customers about legal requirements such stickers usually contain technical information such as type and amount of refrigerant and date last serviced.

Table 6.8 Mandatory Requirement for MAC Inspection

Description	US $
Development of a standard inspection manual	$10,000
Development and printing of pamphlet explaining new laws on MAC systems	$30,000
Development and printing of DOE-approved label for vehicles	$30,000

Training of Technicians from all existing Inspection Stations	$10,000
Refrigerant Identifiers for 31 testing stations * 2 and 42 DOE mobile testing vehicles	$156,000
Sub-total	$236,000
Contingency 10%	$23,600
Total	**$259,600**

4.4.2. Train-the-Trainer Program

A train-the-trainer program will be jointly developed by international and local experts from major MAC manufacturers and technical institutes. The training materials developed under the Multilateral Fund supported train-the-trainer program which was carried out in 1992, will be used as a basis for developing training materials for this component. All training materials will be prepared in the local languages. The objectives of this training program are to educate MAC service technicians on how to properly handle CFC-12 and how to properly repair non-ODS MACs. The training course should provide service technicians with knowledge to retrofit CFC MACs to non-ODS alternatives. Service technicians will be trained not to topping up refrigerants without fixing leaks, and the need for proper labeling of all repaired units. They will also be informed of the potential commercial viability of the use of recovery and recycling machines. The duration for each train-the-trainer session should not be longer than five days.

The Government has already recognized the importance of training in its regulations. As well as possessing a recovery and recycling machine, under the Environmental Quality (Refrigerant Management) Regulations 1999 it is a requirement for all persons who handle CFCs as refrigerants to undertake "approved training in the reclamation and recycling" of CFCs. The Government has not yet approved any CFC recovery and recycling machines or authorized any training institutions to develop approved training courses.

Once training material (code of good practice) is available, DOE will invite potential training centers and technical institutes to submit proposals for having their institutes become authorized training centers for this project component. Before submitting proposals, copies of training materials including the overall objectives of the project will be given to all potential training centers.

Proposals submitted by training centers should provide information regarding their staff members to be in charge of the training courses, descriptions of their existing facilities, proposed duration for its service technician training session (it should not be longer than 2 days), and how much they intend to charge service technicians. Based on this information, DOE will select 30 training centers across the country to be their authorized training centers.

These training centers will be obliged to provide DOE with a list of all technicians who have passed their course along with names and addresses of service shops that they are working with. A database containing names of certified/trained technicians and names and addresses of service shops, will be developed by DOE.

It is proposed that two sets of basic equipment for training such as pressure gauges, vacuum pumps, recovery and recycling machines, and leak detectors, be given to each authorized training center. The selected authorized training centers will use these equipment items for training and certifying service technicians for the next four years (2003 - 2006).

The expert teams that assist DOE in developing the training materials will carry out two five-days workshops to train trainers from the 30 selected training centers. Training will include hands-on sessions. At the end of training, participants will be required to take an examination. Those who pass the examination will receive certificates from DOE. Those who fail they will be required to undertake make-up classes before certificates be given to them. Training centers will not receive a set of basic equipment, mentioned above, free of charge until all of their trainers have received certificates from DOE.

Table 6.9 Train-the-Trainer Program in the MAC Servicing Sector

Description	**US $**
Development and production of training materials	$15,000
Training of trainers (2 five-days courses, 30 persons for each course) by local experts	$5,000
Basic Equipment for 30 Training Centers (2 sets each)*	$270,000
Sub-total	$290,000
Contingency 10%	$29,000
Total	**$319,000**

*Based on a standard cost of $4,500 per set.

Work on this project will begin immediately after funds are allocated. It will take about 12 months to set up this infrastructure.

4.4.3. Certification of Service Technicians

There are about 3,000 MAC service shops throughout the country. To reach out to this target group of 3,000 shops, DOE will conduct a public outreach program including articles in newsletters, trade magazines and radios. The Government will provide positive publicity for those who do attend approved courses. The DOE will periodically publish lists in the newspapers (or other media) of those workshops whose technicians have passed such courses. They will also promote the workshops and technicians through motoring groups such as the Automobile Association of Malaysia (AAM) and the GESA Network Sdn Bhd and other agencies.

The objectives of the public outreach program are as follows:

- To inform service shops of the need to phase out CFCs;
- To inform service shops of the future plan of DOE to restrict the sales of CFCs only among those who have been trained on proper handling of CFCs and CFC MACs;
- To inform service shops of the future import quotas of CFC-12;
- To inform service shops of the proposed requirement from Department of Transport and DOE with regard to labeling of MAC systems and inspection of MACs installed in commercial and non-commercial vehicles;
- To provide service shops with information pertaining to how and where to obtain the training;
- To inform service shops of DOE's assistance to provide basic equipment (i.e. vacuum pumps, pressure gauges, and leak detectors) that is required for proper maintenance of non-ODS MACs. Assistance in a form of a financial subsidy for the procurement of basic equipment will be given to the service shops at which at least one of their technicians has already received training from one of the authorized training centers.

At the same time, DOE will carry out a local shopping procurement process in order to identify qualified suppliers to provide basic equipment items for this project. Service shops that have at least one of their technicians trained and certified can contact one of the qualified suppliers in order to obtain the basic equipment. Qualified suppliers will ask for copies of training certificates, names of certified technicians, addresses and names of the service shops.

Prior to delivery of the products, qualified suppliers will provide this information to DOE. DOE will review this information against its database in order to verify whether technicians have indeed undergone proper training.

Lists of MAC service shops with certified technicians and with basic equipment for proper maintenance of MAC systems will be given to chambers of commerce of respective states or provinces. Unscheduled visits will be made by DOE to service shops to ensure that certified technicians are still working there and that they are practicing the code of good practice trained by the above authorized training centers.

It is proposed that the train-the-trainer program starts in mid 2002, and training of service technicians on proper maintenance of MAC systems (code of good practice) as well as distribution of basic equipment should start from 2003. Service shops associated with major auto manufacturers will be urged by DOE to have their technicians trained and start employing the code of good practice in their service work by mid-2003.

4.4.4. Regulatory Component

Reducing the supply of CFCs will be a key part of ensuring that companies begin planning for CFC phase-out. The Government has agreed to introduce a phase-out schedule for CFCs until 2010. By setting out the phase-out schedule in regulations it will avoid confusion about the Government's intentions and owners of equipment will be able to plan for the phase-out.

These reductions will be implemented through the existing AP system, administered by the Customs Service and MITI. Because of the high risk of smuggling, the Government does not intend to reduce the legal use of CFCs in this sector faster than is necessary to ensure compliance with the Montreal Protocol. The AP ceilings will be set at the amount calculated in the NCFCP as necessary to supply all unfinished projects and the service sector in the relevant year.

It is important to the success of the NCFCP that imports are reduced as this will increase the costs of CFCs relative to HFCs over time. If the supply of CFCs can be reduced (without causing an increase in the amount of CFCs which enter the country illegally) then there will be an increase in the incentives for companies to recycle and carry out other activities to reduce emissions of CFCs.

4.5. FINANCIAL SUBSIDY FOR REFRIGERATION AND MAC MAINTENANCE TOOLS

To ensure that trained service technicians strictly follow the code of good practice when servicing refrigeration and MAC systems, it is important that financial assistance to enable service shops to purchase necessary equipment be provided to them. Various financial assistance options, including full grants, partial grants, and concessional loans, have been considered.

While the concessional loan option was considered by the Malaysian Government as one of the most cost-effective options, it is uncertain as to whether this option will be practical for this sector. Due to a large number of transactions and the small size of each loan, transaction costs are expected to be very high. High transaction costs make this option unattractive. It was agreed that a partial grant approach should be used.

The partial grant option is selected as it will incur less transaction costs. In addition, by requiring service shops to pay part of equipment costs, it will ensure that equipment will be given to only those service shops that really need it.

For determining the funding level to be requested from the Multilateral Fund and the level of subsidy for the partial grant option, the concessional loan option will be used. Based on the funding level determined by this approach, a level of subsidy based on a partial grant option will be determined. The level of subsidy for the partial grant option should ensure that the available funds will be sufficient to provide the same number of

maintenance tools to service shops for both the MAC and refrigeration servicing sectors. Funding of the two sectors will be done in a phased approach, whereby the most important sector, in terms of ODP impact, will be addressed first.

4.5.1. MAC Servicing Sector

As the CFC consumption in the MAC servicing sector is approximately 1,300 ODP tons, the phaseout of CFC consumption in this sector will have a direct impact on Malaysia's ability to meet its 50% and 85% reduction targets in 2005 and 2007. As mentioned previously, the total CFC consumption in the domestic and commercial refrigerator servicing sectors is approximately 130 ODP tons. The phaseout of this consumption may not have significant impact to the country's ability to meet its 50% and 85% reduction targets. However, the phaseout of this consumption is needed for Malaysia to meet its 100% phaseout in 2010. It is agreed that phaseout activities in the MAC servicing sector should get a higher priority.

To determine the funding level for this project component, let assume that a grant funding of $4.41 million be used for establishing a revolving fund to finance CFC phaseout in the MAC servicing sector. This fund would be lent out to qualified equipment suppliers with no interest. The qualified equipment suppliers/borrowers will then provide credits to service shops to buy a basic set of tools that are necessary for properly repair non-ODS MACs.

To start the process, at the beginning of 2003, the total credit line of $4.41 million will be distributed among all qualified suppliers based on their financial capacity and market shares. While the term of credit to be given to service shops should be no longer than 24 months, suppliers are required to settle their accounts in full by the end of 2004. During the loan settlement, suppliers can claim for a loan forgiveness rate of up to 30% (which is the average rate of non-performing loans in Malaysia). To reinvest the remaining funds, credit lines will be redistributed to suppliers. The level of the credit lines will depend on suppliers' past performance. Priority will be given to suppliers that sell more equipment to service shops in the previous round and to those that request a lower loan forgiveness rate. By the end of 2006, all suppliers are required again to resettle their accounts. The remaining funds at the end of 2006 after discounting the loans forgiven rate of up to 30% will then be used for financing the procurement of basic tools for repair CFC-12 and non-CFC refrigeration systems.

Table 6.10. Cash-flow for the Revolving Fund for Purchasing MAC Service Tool Kits

Period	Begin Balance of the Revolving Fund	Ending Balance of the Revolving Fund	Number of Service Tool Kits Purchased*
2003 – 2004	$4,410,000	$3,087,000	1,764
2005 - 2006	$3,087,000	$2,160,900	1,235
Total			2,999

*Based on an estimate cost of $2,500 per set.

According to this model, by the end of 2006 there will be approximately $2 million available in the revolving fund. This resource will be reused for financing procurement of maintenance tools for service shops in the domestic and commercial refrigeration servicing sector.

4.5.2. Refrigeration Servicing Sector

The balance of the above revolving fund at the end of 2006 will be used for financing the purchase of servicing tools for service shops in the refrigeration sector.

In addition to the high transaction costs, another constraint of this model is timing for delivering these service tool kits to all service shops. To ensure that expected repayments are collected at certain dates, it is important that the purchase of service tool kits must be done in one batch at the beginning of each lending cycle. For example, with the lending term of 24 months, all 3,000 MAC service tool kits must be purchased at the beginning of 2003 in order to have the ending balance of the revolving fund equals to $2.1million at the end of 2006. In reality, the purchase of the service tool kits will probably span over a longer period.

It is, therefore, proposed that a funding request of $4.41 million should be made to the Multilateral Fund. The $4.41 million will then be given to 3,000 MAC and 600 refrigeration service shops. Funding to be provided by the Multilateral Fund will cover part of the costs of the equipment. In average, the level of subsidy will be approximately 50% of the equipment cost. It is also proposed that flexibility should be given to the country to work out in details the actual subsidy scheme. Malaysia may consider to employ a sliding-scale on the level of subsidy. That is, to attract participation of service shops at the beginning of the program a higher level of subsidy (more than 50%) can be offered to service shops. However, the level of subsidy will decrease for those shops that decide to join the program at a later date. The following is the financial plan to support this partial grant option.

Table 6.11. Financial Plan for Purchasing Refrigeration and MAC Service Tool Kits

	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**Sub-total**
Resource Allocation	1,250,000	1,250,000	650,000	510,000	250,000	250,000	250,000	4,410,000
Contingency (10%)	125,000	125,000	65,000	51,000	25,000	25,000	25,000	441,000
Total	1,375,000	1,375,000	715,000	561,000	275,000	275,000	275,000	4,851,000

To be qualified for a subsidy from this plan, service technicians must undergo training at the authorized training centers as mentioned in Sector 4.2.2. Vouchers for purchasing service tools will be given to all certified service technicians. Values of the vouchers will

be determined by DOE. Service technicians can use these vouchers to pay for part of the costs of the service tools at any qualified suppliers agreed by DOE. The balance will have to be paid by technicians' own funds. After delivery of the service tools, qualified suppliers will submit vouchers to the financial intermediary to be appointed by DOE in order to get their reimbursement.

4.6. FINANCIAL SUBSIDY FOR FINANCING PROCUREMENT OF 350 R&R MACHINES

Under the Environmental Quality (Refrigerant Management) Regulations 1999 all workshops in Malaysia that use CFCs ("refrigerant environmentally hazardous substance") should have an approved machine for the "reclamation and recycling" of refrigerants. The DOE will work with industry and training bodies to develop appropriate standards. The development of this standard is a priority for DOE and is part of their current work programme. No specific assistance is requested for this activity.

To subsidy the purchase of recovery and recycling machines, a similar approach described in the previous section will be used for determining the level of funding. To start the process, at the beginning of 2003, the total credit line of $412,000 will be distributed among all qualified suppliers based on their financial capacity and market shares. The term of credit to be given to service shops should be no longer than 24 months. Suppliers are required to settle their account in full by the end of 2004. During the loan settlement, suppliers can claim for a loan default rate of up to 30%.

To reinvest the remaining funds, credit lines will be redistributed to suppliers. The level of the credit lines will depend on suppliers' past performance. Priority will be given to suppliers that sell more equipment to service shops in the previous round and to those that request a lower loan default rate. By the end of 2006, all suppliers are required to resettle their accounts and no reinvestment will be undertaken.

Table 6.12. Financial Plan for Purchasing Approximately 350 MAC R&R Machines

Period	Begin Balance of the Revolving Fund	Ending Balance of the Revolving Fund	Number of R&R Machines Purchased
2003 – 2004	$412,000	$288,400	206
2004 – 2006	$288,400	$201,880	144
Total			350

It is proposed that a funding request of $412,000 should be made to the Multilateral Fund. The $412,000 will then be used for supporting the purchase of 350 MAC recovery and recycling machines on a partial grant basis. In average, the level of subsidy will be approximately 60% of the equipment cost. It is also proposed that flexibility should be given to the country to work out in details the actual subsidy scheme. Malaysia may consider to employ a sliding-scale on the level of subsidy. That is, to attract participation of service shops at the beginning of the program a higher level of subsidy (more than 60%) can be offered to service shops. However, the level of subsidy will decrease for

those shops that decide to join the program at a later date. The following is the financial plan to support this partial grant option.

Table 6.13. Financial Plan for Purchasing 350 MAC R&R Machines

	2003	2004	2005	2006	Sub-total
Resource Allocation	103,000	103,000	103,000	103,000	412,000
Contingency (10%)	10,300	10,300	10,300	10,300	41,200
Total	103,000	103,000	103,000	103,000	412,000

4.7. CHILLERS

With the assistance of the five major chiller companies in Malaysia, the NCFCP study identified 821 CFC chillers, installed at 394 sites nation-wide. It is recognised that there may be a small number of chillers, especially older ones that have not been caught by the survey. The maximum number of chillers using CFCs in Malaysia is estimated to be less than 1,000. The manufacturers reported that the 821 chillers they have identified used 77.33 tons of CFC-11 and 25.35 tons of CFC-12.

CFC chillers continued to be installed up until 1995 although the bulk of the existing stock was installed in the late1980s and early 1990s. The average age of the 821 chillers is 16 years.

Few, if any chillers have been decommissioned or converted to alternatives since new CFC chiller stopped being installed. As the average lifetime of a chiller in Malaysia is around 25 years (7% of current stock are currently more than 25 years old), the demand for CFCs in this sector is expected to decline slowly to around 60% of the current level of consumption by 2010 as older buildings and chillers are replaced (unless other policies or practices change).

Because of the very high cost of chillers and their complexity, the servicing of chillers is usually carried out by dedicated service companies which are either part of the manufacturing company or licensed by them. Unlike other sectors, it is the equipment owners that are in greater need "educating" rather than the technicians.

The Malaysian Chapter of the American Society for Heating, Refrigerating and Air conditioning Engineers (MASHRAE) has received US$848,000 from the MLF to establish a centralised recovery and recycle of CFCs given due focus to manage CFC supplies in the chiller sub-sector. When the chillers are serviced or decommissioned, the CFC refrigerants will be recovered into the special containers, which are then returned to MASHRAE for recovery and purification. The recycling facility has begun its operation in early 2001.

DOE plans to work with MASHRAE and the chiller suppliers to make chiller owners aware of the CFC phase-out and the CFC recycling program and to encourage them to begin to plan for early replacement of their chillers. Given that the cost to operate a chiller is relatively high, and in many cases replacing an old CFC chiller with a new non-CFC chiller could also results in energy saving that is large enough to pay for the cost of the new chiller within 4-5 years. Experience from the chiller replacement project to be implemented in Thailand could be applied to this sub-sector in a very near future.

No additional intervention from the Multilateral Fund is required for this particular sector. Moreover, no additional regulations are required to ensure phase-out in this sector. The Environmental Quality (Refrigerant Management) Regulations 1999 has already prohibited the installation of new CFC chillers.

The Government has already agreed to reduce the quota for imports of CFC-11 to the amount needed to service the CFC chillers from 2004 onwards. This amount is likely to be 85 ODP tonnes per year to allow for any unidentified chillers that the NCFCP did not identify. If this amount is found to be to too high, then the Government will review the quota levels in 2007.

5. CAPACITY BUILDING AND TECHNICAL ASSISTANCE ACTIVITIES

In addition to technical assistance activities that are sector-specific, it is proposed that two additional capacity building and technical assistance activities are included in the national CFC Phase out plan. These are:

1. Project Implementation and Monitoring Activity;
2. Customs Training.

5.1. PROJECT IMPLEMENTATION AND MONITORING ACTIVITY

It is proposed that a project implementation and monitoring unit be established to provide the Government with necessary support to carry out all activities proposed under this plan. The national CFC phase out plan entails CFC phase out activities in the manufacturing sector, and training of a large number of small- and medium-scale service shops. In total, this overall plan will involve CFC phase out activities in more than 4,000 private enterprises and government agencies, in addition to a series of activities to establish a policy and regulatory framework to support sustainable CFC phase out.

Implementation of this proposed plan will involve a significant amount of administrative work to facilitate the development of the policy and regulatory framework, identification of additional end-users, database of CFC users, development of enterprise-level project proposals, resource allocation for investment activities, public awareness activities, and other activities including necessary audit works. Implementation of this plan requires a project implementation and monitoring unit with full-time staff.

The following activities, but not limited to, will be managed or carried out by the Project Implementation and Monitoring Unit:

5.1.1. Regulations

The project management team will assist the NOU to undertake the following:

- To develop sector specific phase-out schedules for CFC imports.
- To modify the existing AP system to require importers of R-502 and other mixtures containing CFCs to obtain import permits.
- To amend the Malaysian tariff codes (HS system) to include codes for R-502 and other mixtures containing CFCs as per WCO guidance.
- To prohibit the import of the substances known as "Other fully halogenated CFCs" (Annex B Group 1) in the Montreal Protocol of which, only CFC-13 is known to be manufactured.
- To prohibit the import of CFC-114 and CFC-115 as pure substances as there are no known ongoing needs for these substances.
- To develop an exemption regime to allow imports of prohibited substances for, as yet unknown, essential uses.
- To consider a prohibition on the import of disposable refrigerant containers in 2005 to reduce refrigerant loss at time of disposal and to reduce opportunities for smuggling.
- To include MAC inspection as part of the annual commercial vehicle inspection requirements and as an additional part of existing DOE exhaust gas testing procedures;
- To ban installations of CFC MACs in new commercial vehicles by the end of 2003;
- To issue a revised schedule for import quotas for each chemical in Annex A, Group I of the Montreal Protocol for 2002 – 2010.
- To enforce existing prohibition on the use of CFCs in the aerosol products from 2005 onwards.
- To enforce existing prohibition on the use of CFC-11 in the foam production from 2005 onwards;
- To attach a condition prohibiting the sales of CFC-11 for the use as a blowing agent, to all import licenses issued from 2005 onwards;
- To ban the use of CFC-11 in the production of pre-mixed CFC-11 polyol;
- To include pre-mixed CFC-11 polyol in the list of restricted products whose imports require review and approvals of DOE, from 2005 onwards;
- To issue a regulation or administrative order banning the use of CFC-113 in the manufacturing sector from 2005 onwards except for any quantities needed for "essential uses".;
- To issue a regulation or administrative order prohibiting the use of 1,1,1-TCA in the manufacturing sector from 2005 onwards, except 1,1,1-TCA needed for "essential uses".

5.1.2. Project Implementation

The project management team will undertake the following activities under supervision of the NOU:

- Prepare standard implementation procedures for eligible enterprises that would like to seek funding from the resources provided by the Multilateral Fund;
- Assist eligible CFC consuming enterprises prepare proposals to obtain financial support from the funds provided by the Multilateral Fund to phase out their use of CFCs;
- Arrange technical support, on a need basis, to assist enterprises to identify appropriate non-ODS technology;
- Review and approve proposals submitted by eligible enterprises;
- Co-ordinate the establishment of the networks of authorized training centers for the refrigeration and MAC servicing sectors;
- Facilitate the selection of qualified suppliers to supply tools and equipment for MAC and refrigeration servicing sectors to service shops;
- Provide DOE with recommendations on the level of subsidy for MAC and refrigeration servicing tools and R&R machines;
- Develop and maintain a database of refrigeration and MAC certified technicians including names and addresses of service shops that already have their technicians trained;
- Assist the PUSPAKOM and DOE regional offices to train their vehicle inspection stations and mobile facilities to identify various refrigerant types in the MAC systems;
- Prepare an annual progress report of the overall implementation of the national CFC phase out plan in accordance with any ExCom procedures for this task;
- Investigate the possibility of imposing a duty of five or ten percent on the import of all CFCs to increase their market price and to provide an increased incentive for implementing border controls;
- Investigate options for using licence fees to raise revenue to assist with phase-out of CFCs in the service sector;

5.1.3. PUBLIC AWARENESS

The project management team will undertake the following tasks under supervision of the NOU:

- Disseminate information related to the Government's policy to phase out CFCs in the manufacturing sector in 2005;
- Inform the industry of the availability of funds provided by the Multilateral Fund to support CFC phase out in Malaysia;
- Raise public awareness of the environmental and economic impact of ozone layer depletion to the public via newsletters, news articles, seminars, radio spots;

- Organize a promotional program to encourage the public to have their refrigeration and MAC systems repaired by certified technicians;
- Undertake the public outreach programs for the refrigeration and MAC servicing sectors as described in the previous sections.

5.1.4. MONITORING

The project management team will assist NOU to carry out the following tasks:

- Set up a web site with a list of importers, their annual quotas, and the actual amount already imported within the current calendar year;
- Update the information on the actual amount of imported CFCs with the Custom Department on a quarterly basis;
- Monitor import of HFC-134a, HCFC-22, and HCFC-141b;
- Train DOE state officers to identify and monitor CFC use at the enterprise level;
- Inspect warehouse of CFCs, HCFCs, and HFC-134a importers;
- Report any incidents of illegal import of CFCs;
- Carry out safety and technical audits of all projects undertaken under this plan;
- Update the consumption data at the end-user level once every two years and prepare a revised strategy, if necessary, for DOE;
- Prepare progress reports and annual work plans for submission to the ExCom;
- Maintain good account of all the expenditure incurred by this project.

Table 6.14 Project Implementation and Monitoring Unit (2002 – 2006)*

Description	US $
Regulatory and Policy Support	50,000
Project Implementation and Management (including experts' fees)	450,000
Public Awareness	600,000
Monitoring Activities	300,000
Sub-total	1,400,000
Contingency 10%	140,000
Total	**1,540,000**

*After 2006, remaining tasks will be carried out by the Ozone Protection Unit

5.2. CUSTOMS TRAINING PROGRAM

Malaysia does not produce any CFCs, therefore all of its CFC consumption must be imported. It follows that border controls will be vital to ensure that the Government's policies are implemented. In particular it will be important to ensure that CFCs are not smuggled into Malaysia. If illegal imports of CFCs become common or widespread, it will undermine the whole NCFCP by postponing the phase-out and by penalizing those who remain law abiding.

It is, by definition, impossible to get an accurate picture of the amount of CFCs that might be being imported illegally into Malaysia. There has already been one widely reported example of an illegal shipment being seized by the Royal Customs and Excise Department (Malaysian Customs) in February 2000. During preparation of this strategy we also found the relatively widespread occurrence (which is still under investigation) of CFC-12 being imported disguised as HFC-134a. In both cases the CFCs being imported were labeled wrongly. It is proposed that the enforcement unit of the Ministry of Domestic Trade will take a lead role in investigating any future cases of mislabeling of CFC-12 and HFC-134a at the end-user level.

If Malaysia is to phase out its CFC use successfully there is an urgent need to train customs officers in recognizing CFCs and to provide them the equipment to detect them.

To strengthen the effectiveness of the import control systems for CFCs, it is proposed that a train-the-trainer program be provided to the Customs training facility in Malacca. It is expected that training of Malaysian Customs Officers will initially need to be provided by overseas experts that are familiar with illegal trafficking of CFCs, but following the initial training a specific course will be developed for Customs. This "train-the trainers" training will commence in 2002. It is unlikely to be practical or necessary to provide formal training to all customs officers. Groups of officers from each of the ports will be trained. This training should take three or four days to complete and will include Malaysian legislation, the Montreal Protocol recognition of packaging and storage containers and training in the use of the CFC detection equipment. This training course will be included as part of the standard curriculum of the institute.

To strengthen the enforcement capacity of the Royal Customs and Excise Department officials, it is proposed that two refrigerant identifiers be given to each of the major port/entry points across the country and the training institute of the Custom Department. It is also important to ensure that there is at least one laboratory in Malaysia that can carry out a legally valid test to determine what any gas suspected might be. This testing can be done by most analytical testing laboratories. It will not be necessary to establish a dedicated facility. There may be some costs to establish calibrations for testing equipment at an existing laboratory. These are estimated at US$10,000.

Estimated costs for initial “train the trainers” workshop for the Customs Service, development of training course and sampling procedures are US$50,000 ($20,000 for development of training course, $20,000 for international experts and $10,000 for national experts). In addition, each port will require a hand held testing device that can distinguish between various refrigerant types. According to the Royal Customs and Excise Department there are 32 official points of entry into Malaysia. There are twenty two sea ports and ten land borders. Although there are seven international airports, it is assumed that CFCs will not being imported by air. Each of the 32 designated points of entry will be allocated two detection devices which are estimated to cost around US$ 1,500 each. In practice not all ports will be used to import CFCs and it is likely that the Customs Service may allocate more detection equipment to the seven main shipping ports where the bulk of CFCs are imported through. A decision on the best method of

allocation of the detection equipment will be made by the Customs service in consultation with the international technical expert.

The training providers will assist with the development of policies for sampling of shipments of refrigerant gases as it can be dangerous working with pressure vessels and gases under pressure.

The development of the training courses, the selection of candidates and the distribution of detection equipment, training material and advice will be done in consultation and full co-operation with the Royal Customs and Excise Department.

Table 6.15 Custom Training Program

Description	US $
Development of Training Course and Sampling Procedures	$20,000
International Expert (Fees, Travel, Per Diem)	$20,000
National Expert	$10,000
Refrigerant Identifier Set (2x32x$1,500)	$96,000
Calibrations for Testing Equipment at an Existing Laboratory	$10,000
Sub-total	$156,000
Contingency 10%	$15,600
Total	**$171,600**

To improve enforcement the relevant Government agencies, including DOE, MITI, Statistics and Customs have agreed to establish a group to meet regularly to discuss issues relating to controls on imports of CFCs and to allow rapid dissemination of information on any illegal imports among the enforcement agencies.

As well as increasing their own actions to enforce controls, the DOE also intends to investigate using its local state officers to enforce controls, especially those relating to requirements that workshops must have CFC recovery and recycling machines.

CHAPTER 7
JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

1. AEROSOLS

The following alternatives will be considered under this Plan:

Hydrocarbon aerosol propellants have been the principal alternatives to CFC-12 and CFC-11/12 blends employed world-wide. They are approved by the 1996 UNEP Technical Options Report on Aerosols Sterilants and Miscellaneous Uses and Carbon Tetrachloride. At this time they are the major acceptable alternate for substituting CFCs as aerosol propellants.

Aerosol grade hydrocarbon propellant (HAPs) is not available in Malaysia, but the LPG that is available can be cleaned with molecular sieves for use with most products if a gas is available to lower the pressure.

Dimethyl ether (DME) is a liquefied gas propellant. The advantages of DME include high solvency and ease of reformulation to water-based products. Environmental, health, and safety disadvantages include its flammability, which requires the retrofit or redesign of filling lines and storage facilities, and the fact that it is a volatile organic compound (VOC). DME corrodes tinplate and aluminium cans if water is also present and therefore requires the addition of special corrosion inhibitors. In addition, DME may dissolve can linings. Finally, the use of DME as a propellant requires the sue of butyl rubber or neoprene valve gaskets.

While DME propellant formulations may present a lower potential for fire hazards to workers and fire fighters than do hydrocarbon formulations, the flammability of the total aerosol product must be considered. Therefore, the same fire safety and explosion prevention precautions should be taken in DME filling and storing operations as with hydrocarbon aerosol propellants. In addition, retrofitting or redesign of filling lines and storage facilities will be necessary.

2. FOAM

The presently available ODS phase out technologies for rigid polyurethane insulating foams are:

CLASSIFICATION	LIQUID TECHNOLOGY	GAS TECHNOLOGY
LOW ODP TECHNOLOGIES ("INTERIM")	HCFC-141b HCFC-141b/22	HCFC-22, -142b HCFC-22/142b
NON-ODS TECHNOLOGIES ("PERMANENT")	(CYCLO)PENTANE, WATER, HFC-365, HFC-245fa	HFC-134a

The selection of the alternative technology is governed by the following considerations:

a) Proven and reasonably mature technology
b) Cost effective conversion
c) Local availability of substitute, at acceptable pricing
d) Support from the local systems suppliers
e) Critical properties to be maintained in the end product
f) Meeting established standards on environment and safety

The following is a discussion of the mentioned technologies:

HCFC-141b has an ODP of 0.11. Its application is proven, mature, relatively cost-effective and systems that fit the enterprise's applications are locally available. HCFC-141b can, however, be destabilising in higher concentrations, being a strong solvent, which would lead to the need to increase the foam density. Being an interim option, its application would only be recommended if permanent options do not provide acceptable solutions.

HCFC-22 has an ODP of 0.05 and is under ambient conditions a gas. It is not offered in the applicable regional area as a premixed system and would require an on-site premixer. It is not suitable for spray foam/slabstock applications. Its insulation value is somewhat less than with HCFC-141b.

HCFC-141b/HCFC-22 blends can reduce the solvent effect of HCFC-141b alone and therefore allow lower densities while maintaining acceptable insulation values. The blends are, however, not available in Malaysia or neighbouring countries. On-site blending would significantly increase the one-time project costs. In addition, the technology is not proven for spray foam applications. Being an interim option, the same restrictions as for HCFC-141b would apply.

(CYCLO-)PENTANE meets all selection criteria, except that of local availability. The use of hydrocarbons is a preferred solution when feasible from a safety and cost effectiveness standpoint. The relatively high investments for safety costs tend to limit pentane use to relatively large CFC users. In addition, the use of pentane is limited to those enterprises whose facilities can be adapted to meet safety requirements, and can be relied on to maintain safe operations. While it may be applicable—albeit connected with high investments and density limitations—for the slabstock operation, it cannot be used—and never has been used—for (on-site) spray foam applications, where ever-changing ambient conditions never could provide for the required safety.

WATER-BASED systems are an alternative in cases where pentane is not feasible due to safety concerns, cost efficiency or availability. Water-based systems are, however, more expensive (up to 50%) than other CFC-free technologies due to reductions in insulation value (requiring larger thickness) and lower cell stability (requiring higher densities). They are also currently not available in the regional area. Water-based formulations tend to be most applicable in relatively less critical applications, such as in situ foams and

thermoware. In sprayfoam, while in principle feasible, it is reported that the current technology does not allow for overhead spraying and is therefore limited. For boxfoam, the technology is not applicable as it would lead to an unacceptably high increase in the reaction temperature, leading to severe scorching and even spontaneous combustion.

LIQUID HFCs do not meet requirements on maturity and availability. However, trials show that systems based on these permanent options would be feasible in spray foam as well as slabstock.

HFC-134a is under ambient conditions a gas. It is not offered in the applicable regional area as a premixed system and would require an on-site premixer. It is not suitable for spray foam applications. It is also less energy efficient, and expensive compared to most other technologies.

The following technologies have been considered for the flexible polyurethane foam conversion:

The use of methylene chloride has been for long the standard replacement technology for the use of CFCs in flexible PU slabstock/box foam. Its use has been only limited by regulatory restrictions based on its perceived toxic character and processing problems when used in large amounts.

Recently more regulatory restrictions have emerged on the emissions of MC as well as on allowable workplace concentrations, leading to active searches for replacements. In slabstock, the emergence of liquid carbon dioxide (LCD) is quickly replacing any residual CFC use as well as MC in most developing countries. This technology does not yet apply to boxfoam, where the recent introduction of low index/additive (LIA) technology shows some promise for, at least a partial, replacement of CFCs/methylene chloride.

Enterprises will be informed by the sector expert of the available technical options. If methylene chloride is selected as an alternative technology, enterprises will be required to implement necessary safety measures to ensure occupational health safety of workers.

The following technologies have been considered for the integral skin foam conversion:

Accepted ODS phase out technologies for integral skin moulded foam are:

CLASSIFICATION	**TECHNOLOGY**
LOW ODP TECHNOLOGIES ("INTERIM")	HCFC-141b, HCFC-22
ODS-FREE TECHNOLOGIES ("PERMANENT")	PENTANE, ALL WATER BLOWN, HFC-134a, HFC245fa

The selection of the alternative technology would be governed by the following consideration:

a) Proven and reasonably mature technology;
b) Cost effective conversion;
c) Local availability of substitute, at acceptable pricing;
d) Support from the local systems suppliers;
e) Critical properties to be maintained in the end product;
f) Meeting established standards on environment and safety.

HCFC-22 and HCFC-141b are interim solutions, and as such are regarded as intermediate steps to a final solution. Companies may use HCFC-141b, where necessary, as an interim since it is commercially available and reasonably priced.

In the permanent solutions, pentane is a technologically feasible alternative, but would require extensive and costly safety modifications to implement. The use of pentane, in the case, would be prohibitive from the safety cost standpoint. Gaseous HFCs are used in the United States extensively for shoe soles and steering wheels. Economically, water-blown foams are a more attractive option than systems employing either HCFCs or HFCs, even though water-blown is more costly than CFC-11 blown foams. In addition, carbon dioxide, the resulting blowing agent from the water-blown technology, has no ODP, making water blown the most favorable final solution.

It should be noted that in some individual cases, methylene chloride has been utilized as an effective solution, but due to processing concerns, it cannot be seen as an overall permanent solution.

3. SOLVENT

Selection of alternatives for solvent cleaning applications will be determined during the implementation of the National CFC Phase out Plan. The report of the Solvents, Coatings, and Adhesives Technical Options Committee will be used as a guidance for selecting alternatives. All proposed alternative technologies will be reviewed by the OORG experts before any project activities in this sector can proceed. This is to ensure that all environmental, health, and safety requirements are adequately addressed.

4. COMMERCIAL REFRIGERATION

Refrigeration

The following are common possible substitutes for CFC-12 in commercial refrigerators:

HCFC-22

Advantages:

- Low GWP

- Compatible with mineral oil
- Widely used for many years

Disadvantages:
- High discharge temperatures require special engineering
- Small ODP

HFC-134a

Advantages:
- Zero ODP
- Non-flammable
- System capacity and efficiency unchanged when a specially optimized compressor is used.

Disadvantages:
- Special material required for system drier
- New compressors required
- Special lubricant required (polyol ester). It is very hygroscopic and attacks some seal and motor insulation materials
- Significant GWP

Hydrocarbons

Advantages:
- Same CFC-12 compressors could be used.
- Mineral oil can be used with hydrocarbons
- Zero ODP and GWP

Disadvantages:
- Flammable
- Design modifications required for safe operation

Conclusion

Taking all of the above factors into account it is decided that HFC-134a is the most appropriate choice for small and medium scale enterprises. All of the different components and materials required such as the compressor, polyol ester oil, and charging equipment have been developed for HFC-134a, the use of which is firmly established in developed countries. Additionally, all of the equipment and technical support required to switch to HFC-134a is widely available in the country.

Foam

Several blowing agents exist that in principle could be used to replace CFC-11 in commercial refrigerator production:

HCFC-141b

Advantages:

- Very low flammability
- Widely use in the US and Japan
- Extensive training not necessary

Disadvantages:

- Incompatible with some cabinet liner material
- Small ODP
- Export potential is reduced – some W. European countries prohibit the import of products containing HCFCs.

HFC-134a

Advantages:

- Zero ODP
- Non-flammable
- Compatible with all cabinet liner material
- No tendency to condense

Disadvantages:

- Special mixing equipment required
- Higher thermal conductivity than CFC-11
- Poor solubility in polyols
- Significant GWP
- Expensive

Cyclopentane

Advantages:

- Zero GWP
- Cyclopentane equipment can be used with other blowing agents if need arises.
- Low cost
- Only 70% pure cyclopentane is required. Higher purity levels do not improve heat insulation characteristics.

Disadvantages:

- Explosive in concentrations of 1.5% - 8.7% with air.

- Insulation needs to be increased by 5% to achieve the same thermal conductivity as CFC-11 blown foam.
- Special equipment and safety precautions are required.

Conclusion

Considering the foregoing, HCFC-141b is selected as the blowing agent for the remaining SMEs which are part of this plan. Cyclopentane would have been ideal from an environmental point of view, but is rejected as uneconomical and impractical given the scope and nature of the operations at these enterprises. The Government of Malaysia will review the use of HCFC during the implementation of this plan. If HCFC-141b is the only possible solution, the Government agrees not to seek further funding from the Multilateral Fund to switch to a non-ozone depleting technology, such as cyclopentane, in the future.

5. MOBILE AIR-CONDITIONING

HFC-134a is widely accepted among the automotive industry as the most viable alternative refrigerant for CFC-12 for use in MACs. HFC-134a is a zero ODP alternative.

6. GOVERNMENT'S STATEMENT ON THE USE OF HCFCS AS INTERIM SOLUTIONS

Malaysia is fully aware of the ExCom requirements pertaining to the use of HCFC. The National Ozone Unit will review the use of HCFC during the implementation of this national CFC phase out plan. Malaysia has a preference for non-ODS substances and will enforce the general policy when possible.

CHAPTER 8
COSTS OF NATIONAL CFC PHASE OUT PLAN

Activities	No. of Enterprises	ODP tons	Total Costs US$	Requested Amount US$
Technical Assistance Component for the MDI sector			57,200	57,200
CFC-113 phaseout in the electronic cleaning process	2	2.52	49,720	49,720
1,1,1-TCA phaseout in the metal cleaning industry	13	14.59	561,530	561,530
CFC phaseout in the foam sector				
- Rigid PU Foam	18	42.2		444,580
- Flexible PU Foam	9	74.8		682,180
- Integral Skin Foam	3	2.9		39,930
- Multisector	2	30.9		254,570
Total			1,691,976[1]	1,421,260
CFC phaseout in the MAC manufacturing sector	1		3,179,185	1,259,940
CFC phaseout in the commercial refrigeration manufacturing sector	4	12.24	264,096[2]	137,330
Mandatory Requirement for MAC Inspection	52		259,600	259,600
Train-the-Trainer Program in the MAC Servicing Sector (2 persons each from 30 Training Centers)	30		319,000	319,000
Certification of MAC Service Technicians (3,000 shops * 2 technicians/shop * $50 per person)			300,000	
Financial Subsidy for Purchasing MAC Servicing Equipment	3,000	1,300	8,052,000[3]	4,026,000
Financial Subsidy for Purchasing MAC R&R Equipment	350	120	755,300[4]	453,200
Train-the-Trainer Program in the Refrigeration Servicing Sector (2 persons each from 30 Training Centers)	30		319,000	319,000
Certification of Refrigeration Service Technicians (600 shops * 2 technicians/shop * $50 per person)			60,000	

[1] In average funding provided to previously approved foam projects was 84% of the total costs of conversion.
[2] In average funding provided to previously approved commercial refrigeration project was 52% of the total costs of conversion.
[3] Level of subsidy requested from the MLF is 50% of the total costs.
[4] Level of subsidy requested from the MLF is 60% of the total costs.

Financial Subsidy for Purchasing Refrigeration Servicing Equipment	600	120	1,650,000[5]	825,000
Project Implementation and Monitoring Unit	1		1,540,000	1,540,000
Customs Training Program	32		171,600	171,600
Total	**4,147**	**1,720.15**	**17,580,207[6]**	**11,400,380**

[5] Level of subsidy requested from the MLF is 50% of the total costs.
[6] Not including any costs related to early retirement of existing CFC refrigerators and MACs.

CHAPTER 9
NATIONAL CFC PHASEOUT SCHEDULE FOR MALAYSIA

The Government of Malaysia will announce an import schedule for Annex A, Group I, chemicals for 2002 – 2010 within 12 months after funding for this national CFC phase out plan has been approved by the ExCom. No import licenses will be given to new importers. The proposed annual quota will be distributed among existing importers (the full list of importers that are currently imported CFCs to Malaysia is included in Annex 1).

Table 9.1. Import Quota for Annex A, Group I Chemicals

Import Quota	**2002**	**2003**	**2004**	**2005**	**2006**
Annex A, Group I (ODP tons) or	1,855	1,566	1,136	699	579
Annex Group I (MT tons)	1,865	1,576	1,146	707	586

Import Quota	**2007**	**2008**	**2009**	**2010**	**2011**
Annex A, Group I (ODP tons) or	490	401	332	0	0
Annex Group I (MT tons)	495	404	333		

Table 9.2. Import Quota for Annex B, Group I Chemicals

Import Quota	**2002**	**2003**	**2004**	**2005**	**2006**
Annex B, Group I (ODP tons) or	0	0	0	0	0
Annex B, Group I (MT tons)	0	0	0	0	0

Import Quota	**2007**	**2008**	**2009**	**2010**	**2011**
Annex B, Group I (ODP tons) or	0	0	0	0	0
Annex B, Group I (MT tons)	0	0	0	0	0

Table 9.3. Import Quota for Annex B, Group II Chemicals

Import Quota	**2002**	**2003**	**2004**	**2005**	**2006**
Annex B, Group II (ODP tons) or	12.65	12.65	12.65	12.65	12.65
Annex B, Group II (MT tons)	11.50	11.50	11.50	11.50	11.50

Import Quota	**2007**	**2008**	**2009**	**2010**	**2011**
Annex B, Group II (ODP tons) or	12.65	12.65	12.65	12.65	12.65
Annex B, Group II (MT tons)	11.50	11.50	11.50	11.50	11.50

Table 9.4. Import Quota for Annex B, Group III Chemicals

Import Quota	**2002**	**2003**	**2004**	**2005**	**2006**
Annex B, Group III (ODP tons) or	51	48	48	18	18
Annex B, Group III (MT tons)	510	477	477	180	180

Import Quota	**2007**	**2008**	**2009**	**2010**	**2011**
Annex B, Group III (ODP tons) or	18	18	18	18	18
Annex B, Group III (MT tons)	180	180	180	180	180

CHAPTER 10
IMPLEMENTATION AND MONITORING

1. INTRODUCTION

The National CFC Phaseout Plan employs a phase out strategy based on a combination of policy and regulatory support, investment and non-investment activities, including public awareness and other supporting measures. Instead of a traditional approach where enterprises are identified and individual projects prepared for each individual enterprise, the national CFC phase out plan requires enterprises to be proactive and apply for funds based on rules and guidelines established as part of this program, consistent with MLF funding principles.

To attain proactive participation from the industry, the national CFC phase out plan proposes to utilise various incentive structures, including financial and regulatory incentives. These incentive structures are designed with the aim of ensuring permanent and sustainable reduction of CFC phase out. In addition, public awareness activities are also built into this national CFC phase out plan to ensure that the whole industry is fully informed about the phase out plan, the short-term and long-term implications of the global CFC phase out efforts, and the possibility for obtaining funding to cover part of the phase out costs.

The national CFC phase out plan covers a number of sectors and sub-sectors with different profiles. Phase out approaches are sector and sub-sector specific. The national implementation modality for the different sectors and sub-sectors has been agreed by DOE and the relevant industry sectors. The national CFC phase out plan also sets specific milestones to be achieved before MLF funds can be provided to Malaysia.

2. NATIONAL IMPLEMENTATION AND FINANCING MODALITIES

The agreed implementation modalities for various sectors and sub-sectors are as follows:

2.1. GRANT FUNDING BASED ON AVERAGE COST-EFFECTIVENESS OF PREVIOUSLY MLF APPROVED PROJECTS FOR MALAYSIA OF RESPECTIVE SECTOR AND SUB-SECTOR

The following implementation and financing modalities will be applied to investment projects in the solvent (CFC-113, 1,1,1-TCA), commercial refrigeration, and foam sectors.

(a) Advertising and promotion of the MLF funding and CFC phase out program will be done through workshops, national newspapers and trade magazines. All enterprises in these three sectors will be invited to attend the project preparation workshops. At

these workshops, the project management unit (to be appointed by DOE) will provide training to enterprises on how to prepare project proposals;

(b) For enterprises that require technical assistance to identify suitable non-ODS alternatives, they should submit their request to DOE. Sector experts would be hired as appropriates to assist these enterprises in selecting appropriate non-ODS technologies and/or alternatives;

(c) All enterprises are invited to submit requests for funding in line with the MLF guidelines (no production expansion nor technology upgrade, funding requests must exclude export components). Priority will be given to the most cost-effective proposals. In case, phase out costs requested by enterprises exceed the funding approved by the MLF, funding will be capped at the average level of cost-effectiveness of previously MLF approved projects in respective sectors or sub-sectors. In case there are savings, the remaining funds will be used for financing additional enterprises that are not included in this plan;

(d) Enterprises are required to submit their proposals before the end of 2003;

(e) Funding priority should only be given to enterprises that were established before July 1995. After the deadline for submission of proposals, if the total funding request for all eligible projects is less than the amount approved, savings can be used for assisting those enterprises established after July 1995;

(f) Each enterprise is required to provide detailed information regarding baseline situation and CFC consumption. Before signing contracts, information provided by enterprises will be verified by the project management team.

2.2. PARTIAL GRANT FINANCING FOR PURCHASING OF REFRIGERATION AND MAC SERVICING TOOLS AND MAC R&R MACHINES

This financing modality will be applied to all refrigeration and MAC service shops. Partial grant funding approach will be employed. Possibly, a sliding scale of the level of subsidy will be used. For those participate early, a higher subsidy level will be provided to assist them in purchasing service tools for proper maintenance of CFC-12 and non-CFC refrigerators and MACs, and MAC recovery and recycling machines.

(a) The project management team will undertake a selection process to identify qualified suppliers for providing service tools and MAC recovery and recycling machines.

(b) Public outreach program including articles in newsletters, newspapers, trade magazines, radios, and workshops will be carried out by the project management team. This program intends to inform service shops of the need to phase out CFCs, future plans of DOE to restrict the sales of CFCs only among those who have been trained on proper handling of CFCs, information about the authorised training centres, and the availability of financial assistance to support the procurement of basic tools for proper maintenance of non-CFC and CFC-12 refrigeration and MAC systems.

(c) To be qualified for financial assistance, service shops must have at least one of their technicians trained and certified at one of the training centres authorised by DOE. Training centres will provide a list of certified technicians to DOE. DOE will include

names of certified technicians and service shops that they associate with into DOE's database.

(d) Financial assistance should only be given to certified technicians.

2.3. FULL GRANT FINANCING FOR TECHNICAL ASSISTANCE AND CAPACITY BUILDING COMPONENTS

This financing modality will be applied to technical assistance components, capacity building components, such as train-the-trainer programs, technical capacity building for vehicle inspection-stations, Customs training, and other activities.

3. IMPLEMENTATION SCHEDULE

Table10.1. Implementation Schedule

Task	2001				2002				2003				2004				2005				2006				2007				2008				2009				2010			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Technical Assistance for MDI Sector																																								
(i) Selection of Consultant							x																																	
(ii) Consultation process								x	x	x																														
(iii) Development of MDI strategy											x	x																												
Investment Projects for CFC-113																																								
(i) Contract signed									x	x																														
(ii) Equipment delivered										x	x	x	x																											
(iii) Test and trials													x	x	x																									
(iv) Announce ban on CFC use in the solvent sector												x																												
(v) Activity Completed																x																								
Investment Projects for 1,1,1-TCA																																								
(i) Contract signed									x	x	x	x																												
(ii) Equipment delivered										x	x	x	x	x																										
(iii) Test and trials											x	x	x	x	x																									
(iv) Announce ban on TCA use												x																												
(v) Activity Completed																x																								
Investment Projects in the Foam Sector																																								
(i) Contract signed									x	x	x	x																												
(ii) Equipment delivered										x	x	x	x																											
(iii) Test and trials													x	x	x																									
(iv) Announce ban on CFC use in the foam sector												x																												
(v) Activity Completed																x																								
Investment Projects in the Commercial Refrigeration Sector																																								
(i) Contract signed									x	x	x	x																												
(ii) Equipment delivered										x	x	x	x																											
(iii) Test and trials													x	x	x																									
(iv) Announce ban on CFC use in the foam sector												x																												
(v) Activity Completed																x																								
Investment Projects in the MAC Sector																																								
(i) Contract signed						x																																	
(ii) Equipment delivered							x	x	x																															

(iii) Test and trials										x	x																													
(iv) Announce ban on CFC use in the foam sector												x																												
(v) Activity Completed												x																												
Mobile Air-Conditioning Servicing Sector																																								
(i) Development of a Standard Inspection Manual							x	x																																
(ii) Training for Vehicle Inspection Technicians									x	x	x	x																												
(iii) Procurement of Equipment									x	x	x	x																												
(iv) Equipment Delivered										x	x	x																												
(v) Mandatory Inspection													x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(vi) Train-the-Trainer Program							x	x	x	x																														
(vii) Certification of Service Technicians									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																
(viii) Procurement of MAC Service Tools									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																
(ix) Procurement of MAC R&R Machines									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																
Task	**2001**				**2002**				**2003**				**2004**				**2005**				**2006**				**2007**				**2008**				**2009**				**2010**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Refrigeration Servicing Sector																																								
(i) Train-the-Trainer Program																			x	x	x	x																		
(ii) Certification of Service Technicians																					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
(iii) Procurement of Refrigeration Service Tools																					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
Project Management Unit																																								
(i) Implementation Assistance					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																
(ii) Public Awareness Activities					x	x	x	x	x	x	x	x																												
(iii) Regulatory Support					x	x	x	x	x	x	x	x																												
(iv) Monitoring													x	x	x	x	x	x	x	x																				
(v) Activity Completed																								x*																
Customs Training Program																																								
(i) Development of a Training Course							x	x	x																															
(ii) Train-the-Trainer Program										x	x																													
(iii) Procurement of Equipment											x	x																												
(iv) Enforcement													x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*After 2006, remaining tasks under the project management unit will be carried out by the Ozone Protection Unit.

4. CASH-FLOW FOR THE NATIONAL CFC PHASEOUT PLAN FOR MALAYSIA

Table 10.2. Cash-flow for the National CFC Phaseout Plan fot Malaysia

Description	Total Request (US$)	2001	2002	2003	2004	2005	2006	2007	2008	2009
TA for MDIs	57,200		57,200							
Investment Projects - CFC-113	49,720			49,720						
Investment Projects - 1,1,1-TCA	561,530			561,530						
Investment Projects - Foam	1,421,260			1,421,260						
Investment Projects - Comm. Refrigeration	137,330			137,330						
Investment Projects - MACs	1,259,940	1,259,940								
Train-the-Trainer - Ref.	319,000					180,000	139,000			
Certification of Ref. Technicians										
Financial Subsidy for Purchasing Refrigeration Servicing Equipment	825,000							275,000	275,000	275,000
MAC Inspection Requirement	259,600		100,000	159,600						
Train-the-Trainer - MAC	319,000		180,000	139,000						
Certification of MAC Technicians										
Financial Subsidy for Purchasing MAC Servicing Equipment	4,026,000			1,375,000	1,375,000	715,000	561,000			
Financial Subsidy for Purchasing MAC R&R Machines	412,000			103,000	103,000	103,000	103,000			
Project Implem. And Monitoring U.	1,540,000	540,000	200,000	200,000	200,000	200,000	200,000			
Custom Training	171,600		85,800	85,800						
Total	11,359,180	1,799,940	623,000	4,232,240	1,678,000	1,198,000	1,003,000	275,000	275,000	275,000

5. KEY PROJECT IMPLEMENTATION MILESTONES

Milestone	Performance Target	Amount (US$)
1st Tranche (2001)	The national CFC phaseout plan approved by ExCom.	$1,799,940
2nd Tranche (2002)	Import control policy in place and operational.	$623,000
3rd Tranche (2003)	Announcement of the national CFC phaseout plan and phaseout schedule/ import quota for CFCs from 2002 – 2010; Criteria and procedures for seeking financial support for investment projects completed and distributed to eligible enterprises; Announcement of the Department of Transport and DOE of their MAC inspection program;	$4,232,240
4th Tranche (2004)	Ban on the use of CFCs in the manufacturing sector in 2005 is in place.	$1,678,000
5th Tranche (2005)	All CFC phaseout activities in manufacturing sectors completed.	$1,198,000
6th Tranche (2006)	Database of trained technicians in the MAC sector is functional.	$1,003,000
7th Tranche (2007)	CFC import in the previous year is within the respective limit proposed under this plan.	$275,000
8th Tranche (2008)	CFC import in the previous year is within the respective limit proposed under this plan.	$275,000
9th Tranche (2009)	CFC import in the previous year is within the respective limit proposed under this plan.	$275,000

ANNEX

ANNEX 1 : LIST OF IMPORTERS

No	Names of Importers
1	Associated Air Park Ind
2	Chemquest Trading
3	CCM Industrial Chemicals S/b
4	Cosmo Polyuerethane
5	Cosmo Industry Company
6	Cyrstal Foam Industry
7	Daichem Enterprise
8	Euro-Chemo-Pharma
9	E.P.O. Corportation/R-Max Supply
10	General Scientific S/B
11	Globechem
12	Government Agencies
13	Jemco
14	Keylargo
15	Kilang Buatan Sponge Siaw Jun
16	Kinablau Furniture Manufacturing
17	Kimia Pertama
18	M'sia Int Tdg Corp
19	Nagase (M) S/b
20	Nian Aik Fgoam
21	Perusahaan Kimia Gemilang
22	P.P. Chemical
23	Safery
24	Sariteknik
25	Sitt Tatt Chemicals
26	Sing wee Bee
27	Syarikat Carto

28	Tesway
29	Texas Instruments
30	Texcarrier
31	Top Therma Manufacturing
32	Unigas
33	Westech
34	Widetech S/B

ANNEX 2 : STANDARD COSTS

The following standard costs are applied to the national CFC phaseout plan:

Recovery and Recycling equipment:

- Recovery and Recycling machine $ 2,000

MAC and Refrigeration Servicing Equipment for Training Centers:

• Vacuum pump	$ 800
• Manifold and gauges	$ 300
• Hoses	$ 100
• Portable leak detector	$ 500
• Refrigerant charging cylinder	$ 800
• Recovery and Recycling machine	$ 2,000
Total	$ 4,500

MAC and Refrigeration Servicing Equipment for Service Shops:

• Vacuum pump	$ 800
• Manifold and gauges	$ 300
• Hoses	$ 100
• Portable leak detector	$ 500
• Refrigerant charging cylinder	$ 800
Total	$ 2,500

Equipment for Vehicle Inspection Stations and Customs Department

- Refrigerant Identifier $1,500

ANNEX 3 : ENVIRONMENTAL ASSESSMENT

All project components proposed under the National CFC Phaseout Plan will employ alternative technologies that are recommended by UNEP Technical Options Committees for the relevant sectors. All applicable government environmental, health and safety regulations will be conformed with.

All project components proposed under the Plan will enable existing enterprises to convert to non-ODS alternatives. Therefore, no job loss or any adverse social impact is envisaged.

ATTACHMENT

ATTACHMENT

PROJECT PROPOSAL DOCUMENT

COUNTRY: MALAYSIA

IMPLEMENTING AGENCY: The World Bank

PROJECT TITLE: Replacement of CFC-12 refrigerant with HFC-134a in the production of Mobile Air-Conditioning Systems at Seasonair (M) Sdn. Bhd.

PROJECT IN CURRENT BUSINESS PLAN: **NO**

SECTOR/SUB-SECTOR COVERED: Mobile Air Conditioning

ODS USE IN SECTOR (1998): 1300.0 MT of CFC-12

ODS USE IN ENTERPRISE:

PROJECT IMPACT: Indirect impact of 49 ODP Tons of CFC-12

PROJECT DURATION: 2 years

PROJECT COSTS: (total and full costs of the project)

Incremental Capital Cost:	US$ 2,944,805
10% Contingency:	US$ 234,380
Incremental Operating Cost:	US$ 0
Total Project Cost:	**US$ 3,179,185**

LOCAL OWNERSHIP: 100% **EXPORT COMPONENT** 100% (Article 5 Countries)

REQUESTED GRANT: **US$ 1,259,940**

IA SUPPORT COST: US$ 65,000 (13% of the first $500,000 grant amount)
US$ 83,593 (11% of the remaining amount)

TOTAL COST OF PROJECT TO THE MLF: **US$ 1,408,533**

COST EFFECTIVENESS: 25.71 US$/kg (based on indirect impact of 49 ODP tons)

STATUS OF COUNTERPART FUNDING: Enterprise Commitment Letter attached

PROJECT MONITORING MILESTONES INCLUDED: **YES X**

NATIONAL COORDINATING AGENCY: Department of Environment Malaysia (DOE)

PROJECT SUMMARY

Seasonair (M) Sdn. Bhd. manufactures Mobile Air Conditioning (MAC) condensers for cars and heavy commercial vehicles. The proposed conversion project at Seasonair will contribute to an indirect phaseout of 49 ODP Tons of CFC 12. To ensure a complete ban of new CFC MAC installations in commercial vehicles, the Government of Malaysia proposes as part of its National CFC Phaseout Plan to impose a mandatory inspection of MAC systems in commercial vehicles at the beginning of 2004. The Department of Land Transport will not issue or renew any vehicle registrations to commercial vehicles registered after 2003, if their MAC systems contain CFC-12. The company's manufacturing line currently comprises of condenser assembly line and condenser brazing section. The enterprise is proposing to replace these two production sections and requests for the Multilateral Fund support of US$1,259,940. This support will cover part of the capital costs and costs of technology transfer and training that are necessary for the success of this project.

IMPACT OF PROJECT ON COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS:
When implemented as scheduled, the CFC-12 consumption eliminated by Seasonair will contribute to the effort of the Government of Malaysia to meet its 50% reduction targets and other subsequent obligations.

Prepared by: Seasonair and CETEC Date: 12 September 2001
Reviewed by: James A. Baker Date: 12 September 2001

1. PROJECT OBJECTIVES

The objective of this project is to assist in the phase-out of CFC-12 in the Mobile Air-Conditioning sector by targeting the upstream production of CFC-12 MAC System at Seasonair (M) Sdn. Bhd. (Seasonair) located at Lot 4, Jalan Ipoh, Batu 18, Rawang Industrial & Housing Estate, Taman Rawang Perdana, 48000 Rawang, Selangor Darul Ehsan, Malaysia. To achieve this objective, the project will support the introduction of HFC 134a MAC condenser manufacturing facilities at Seasonair (M) Sdn. Bhd.

2. CONSUMPTION OF ODS IN THE SECTOR

CFC-12 is widely used in the MAC industry in Malaysia. It is used as refrigerant in air conditioning systems for a wide variety of vehicles, including passenger cars, commercial vehicles, trucks and buses. In 2000 the MAC sector in Malaysia consumed an estimated 1,300 MT CFC 12, (about 68% of total known CFC consumption in Malaysia).

There are six major MAC manufacturers and suppliers in Malaysia namely Denso (M) Bhd., UCM Industrial Corporation (M) Bhd., APM Air Conditioning (M) Sdn. Bhd., Sanden International (M) Sdn. Bhd., Seasonair (M) Sdn. Bhd., and PATCO (M) Sdn. Bhd. Out of these six manufacturers, the first three had completed their ODS phaseout projects under financial assistance from the MLF. The breakdown for ODS consumption at the first three MAC Manufacturers and the impact of the MAC R&R project is provided in Table 1. PATCO had already completed its ODS phaseout since early 1997 without financial assistance from the Fund. The ExCom has recently approved additional funding to support conversion at Sanden International at its last ExCom meeting. Therefore, Seasonair is the only remaining MAC manufacturer that has not converted nor received any funding from the MLF.

Seasonair is requesting funding from the MLF to support conversion of its MAC heat exchanger production facility. Seasonair is a MAC component manufacturer. The Government of Malaysia realizes that according to the existing ExCom decision (Dec. 17/6 para. 14 and para. 14b) project proposals in the MAC sub-sector should emanate from the manufacturers of MAC units themselves, not the manufacturers of component parts. The Government still, however, wishes to request the MLF to provide support for conversion of component manufacturing at Seasonair as it will allow the Government to totally ban installation of CFC MACs in commercial vehicles by the end of 2003. Starting from January 2004, no vehicle registrations will be given to any new commercial vehicles equipped with CFC MACs. No more funding for projects in the MAC manufacturing sub-sector will be submitted to the ExCom.

To reduce the demand of CFC-12 in the MAC sector, Malaysia has developed a strategy addressing CFC-12 phaseout in the MAC manufacturing and servicing sectors. For the manufacturing sector, the Government of Malaysia has employed both voluntary and regulatory approaches to encourage CFC-12 MAC manufacturers to terminate the production of CFC-12 MACs and replace them with HFC-134a MACs. As a result four out of six MAC manufacturers have already converted to HFC-134a. The recently approved project for Sanden will be completed by the end of 2002.

For the service sector, Malaysia has already developed a CFC-12 MAC recycling project network. The project had been implemented and completed since 1995. A total of 200 units of CFC recovery and recycling equipment had been distributed to selected MAC service shops throughout the country.

The Government of Malaysia had recently come out with the Environmental Quality (Refrigerant Management) Regulations 1999 under the Environmental Quality Act, 1974 (Amendment 1996) which had come into force since 1st January 2000. The regulations aim at controlling the use of CFC refrigerants in the service sector and stop its use in new installations. The requirement for training programs for undertaking the retrofitting refrigerant systems have also been specifically mentioned in these regulations.

This proposed conversion project is, therefore, in line with the Government's policy and it has been identified as one of the activities that need to be undertaken expeditiously to ensure Malaysia's full compliance with the obligations of the Montreal Protocol.

Currently the Government of Malaysia, under the purview of Department of Environment and assisted by the World Bank International consultants and a local consultant, is carrying out a National CFC Phase-out Plan to assess the situation and verify the data from different sources with respect to the importation and consumption of ODS in Malaysia in year 2000 and beyond. Conversion of the MAC heat exchanger production facility at Seasonair (M) is identified as one of the activities that need to be undertaken expeditiously.

Table 1: Quantity of ODS Phaseout in the MAC Sector by Investment Projects under MLF (as of 31 July 2001)

		Types of ODS Consumed					Status/Progress
No.	**Sub-project Description**	**CFC-11**	**CFC-12**	**CFC-113**	**MTC**	**Total**	
1	Department of Environment: MAC Recovery and Recycling Project		700			700	COMPLETED in March 1996. 200 CFC12 recycling machines have been distributed to the selected workshops.
2	Denso (M) Sdn. Bhd. (formerly known as Nippondenso Capital Sdn. Bhd.) Conversion of CFC-12 based MAC systems to HFC-134a based.		120			120	COMPLETED in October 1998.
3	APM Air Conditioning Sdn. Bhd. Conversion of CFC-12 based MAC manufacturing to HFC-134a based system.		75		5	80	COMPLETED in November 2000.
4	UCM Sdn. Bhd. Conversion of CFC-12 based MAC manufacturing to HFC-134a based system.		41.4			41.4	COMPLETED in September 2000.
5	Sanden International (M): Conversion of CFC-12 based MAC manufacturing to HFC-134a based system.		120			120	To be completed in December 2002.
Total	**Completed**		1056.4		5	1061.4	
	Not Completed						
	Overall		1056.4		5	1061.4	

3. ENTERPRISE BACKGROUND

Seasonair is a company incorporated in Malaysia with 100% local ownership and was established since 1991. Seasonair currently employs 100 employees for its MAC condenser manufacturing. In 2000, Seasonair recorded a turnover of about RM 15.0 million (US$ 3.95 million). Seasonair manufactures R-12 MAC fin-and-tube condenser and evaporators. Its products are mainly for commercial vehicles. In Malaysia, Seasonair sells its heat exchangers to the following categories of customers:

1. A/C contractors – Contractors usually have their own workshops for service, repair and installation. They also secure contracts with automobile manufacturers, car dealers and/or sales outlets. While these contractors source heat exchanger mainly from Seasonair, they obtain the rest of the standard components from other suppliers or traders.
2. A/C distributors – Distributors resale heat exchangers to contractors.
3. OEM MAC manufacturers – For example, APM, UCM, PATCO and others also purchase evaporators from Seasonair's distributors. These evaporators are, then, installed in commercial vehicles.

Seasonair's products which have a market share of 40% in the commercial vehicles sector are installed mainly in new commercial vehicles by A/C installation contractors all over the country. The total number of commercial vehicles fitted with MAC systems for 2000 was 60,839 units. The remaining 60% of the share are distributed between PATCO, UCM, APM, Sanden and Denso. In the passenger car sector, Seasonair's market is restricted to a small quantity of imported cars. Seasonair does not provide MAC system installation service. Installation of Seasonair MAC components is done by MAC contractors, MAC system manufacturers/local car assemblers themselves.

From 1970 till 1980, almost all the MAC systems in the world are made of tube fin design which is used 100% in CFC 12 MAC systems. In the Replacement Equipment Market (REM) sector, Seasonair is the market leader in supplying approximately 65 percent of the total after-market requirement for REM condensers which is originally tube-fin in nature in Malaysia. Seasonair, being the only local tube fin MAC producer, also registers exports amounting to RM 7.20 million (US$ 1.89 million) annually to mainly Asian countries such as Singapore, Indonesia, Brunei, and Thailand.

Seasonair's annual production of R-12 MAC System condenser/evaporator assemblies for passenger and commercial vehicles was approximately 77,000 units (average of 1997 - 2000). This represents 64% of its current production capacity of 120,000 units per year.

Table 3.1: Detail Breakdown of R-12 MAC Fin-and-Tube Heat Exchanger Production by Seasonair (M) Sdn. Bhd., 1997 - 2000

YEAR	CFC 12 MAC			Indirect
	New	REM	TOTAL (A)	Impact (ODP Tons)
1997	16,131	22,500	38,631	37
1998	12,650	14,232	26,882	26
1999	21,016	21,016	42,032	40
2000	24,340	22,250	46,590	45
TOTAL	**74,137**	**79,998**	**154,135**	**148**
AVG.	**18,534**	**20,000**	**38,534**	**49**

In 1999, Seasonair exported 21,200 units of heat exchanger coils. Major export markets are Indonesia, Singapore, Lebanon, Egypt and United Arab Emirates (*See Tables 3.2a and 3.2b*). Almost the same number of units was exported in 2000.

Table 3.2: Seasonair's Exported in Article 5 Countries, 1997 - 1999.

Year	Export to	Type/Name (Parts)	Qty. (units)
1997	SINGAPORE	CONDENSER/EVAPORATOR ASSEMBLIES	7,700
	INDONESIA	CONDENSER/EVAPORATOR ASSEMBLIES	6,000
	UNITED ARAB EMIRATES	CONDENSER/EVAPORATOR ASSEMBLIES	6,500
	LEBANON	CONDENSER/EVAPORATOR ASSEMBLIES	1,000
	BRUNEI, INDIA, BAHRAIN	CONDENSER/EVAPORATOR ASSEMBLIES	500
	THAILAND	CONDENSER/EVAPORATOR ASSEMBLIES	300
		Total exported for 1997	***22,000***
1998	SINGAPORE	CONDENSER/EVAPORATOR ASSEMBLIES	7,500
	INDONESIA	CONDENSER/EVAPORATOR ASSEMBLIES	5,000
	UNITED ARAB EMIRATES	CONDENSER/EVAPORATOR ASSEMBLIES	4,500
	LEBANON	CONDENSER/EVAPORATOR ASSEMBLIES	1.500
	BRUNEI, INDIA, BAHRAIN	CONDENSER/EVAPORATOR ASSEMBLIES	1,500
	THAILAND, MALTA	CONDENSER/EVAPORATOR ASSEMBLIES	200
		Total exported for 1998	***20,200***
1999	SINGAPORE	CONDENSER/EVAPORATOR ASSEMBLIES	7,500
	INDONESIA	CONDENSER/EVAPORATOR ASSEMBLIES	5,500
	UNITED ARAB EMIRATES	CONDENSER/EVAPORATOR ASSEMBLIES	5,000
	LEBANON	CONDENSER/EVAPORATOR ASSEMBLIES	2,000
	BRUNEI, INDIA, BAHRAIN	CONDENSER/EVAPORATOR ASSEMBLIES	1,000
	THAILAND, KUWAIT	CONDENSER/EVAPORATOR ASSEMBLIES	200
		Total exported for 1999	***21,200***

For the proposed Non-CFC MAC System manufacturing operations, Seasonair will seek a technical agreement from the selected system manufacturer(s), which covers the various technical aspects of phase-out and conversion. The details of the investment costs are given in Annex 1. The list of equipment to be replaced under this project is given in Table 3.3 and in Annex 5. The Factory layout sketches (current and future) are also given in Annex 5.

The enterprise used 83.70 MT of TCA for its cleaning process. Seasonair will phase out the use of 1,1,1-TCA, however, no funding request is made at this time. Phasing out of 1,1,1-TCA at Seasonair is included as part of the National CFC Phaseout Plan.

4. PROJECT DESCRIPTION

The project will support Seasonair's efforts to convert its existing production of fin-and-tupe heat exchangers for CFC-12 MACs to parallel flow heat exchangers that are more thermodynamically suitable for HFC-134a MAC systems.

Seasonair will also be committed in the elimination of 83.70 MT of 1,1,1-TCA annually used in the components cleaning process by replacing it with a non-ODS cleaning solvent, 1,1,1,2-Tetrachoroethane. Funding request for this component will be made under the Malaysia National CFC Phaseout Plan.

It is not technically justified to replace R-134a condensers with tube fin condensers. In Parallel Flow (PF) system, which is now commonly used in R-134a system, it has the advantage of increasing the condensing capacity by providing huge primary/tube surface areas, which is essential in R-134a system because of higher system pressure. If fin-and-tube heat exchangers are used with HFC-134a system, the system will operate at higher pressure, which will result in the loss of cooling efficiency.

Section A below describes Seasonair's current or "baseline" production, while Section B describes its post-project HFC-134 production.

A. Baseline Description: Current Production

The Seasonair's plant currently produces fin-and-tube heat exchangers and other MAC components. The following is the major MAC components, which Seasonair currently manufactures in-house:

- Condensers
- Plastic injection casings
- Metal Stamped components
- Rubber Hose lines fittings and connections
- Aluminum fittings and pipings
- Evaporators
- Resistors and motor speed controllers

The components which are currently cleaned by TCA are the condensers, evaporators, metal parts, fittings and the connectors.

Major components, which are not manufactured in-house for the complete MAC systems assembly are compressors, receiver driers, rubber hoses, pressure switches, fan motors, expansion valves and switches.

B. Post-project Description:

Seasonair will stop its production of fin-and-tube heat exchangers at the end of 2003 when the new production line for parallel flow heat exchangers starts its operation.

Project Implementation Schedule as stated in Table 7.1 shows that the new machinery will be delivered at the end of 2002. Trial production and training will start immediately and is anticipated to last for 3 months before the actual conversion of condensers can begin. Seasonair can only start converting the R-12 condensers to R-134a in second quarter of 2003. Due to the numerous models requiring conversion, Seasonair anticipated that all the R-12 condensers would be fully converted only by the end of 2003.

C. New Production Line for Parallel Flow Heat Exchangers

Design changes and modifications to existing condensers, piping lines and connections, are necessary in order to accommodate the HFC 134a refrigerant with the exception of evaporators. The required changes and modifications are as follows:

a) Evaporators:- No equipment investment will be required for evaporators except special designed fittings on the piping for new refrigerant application. These new designed features are required for differentiating CFC-12 and HFC-134a evaporators.

b) Condenser:- The fin-and-tube condensers currently produced by Seasonair are not HFC134a compatible. Significant changes in designs are necessary so that the new condensers can conform with the market requirement:

- The new design should be multi-flows with increased heat rejection capability in order to achieve the similar cooling capacity.
- More efficient fins and header tubes designs for faster heat transfer capability.
- Bigger tubes and piping connections to accommodate easier flow of refrigerant and to prevent undesired excessive pressure built up in the condenser.
- Charging ports for HFC 134a application are designed at aluminum pipe and hose fittings to differentiate from CFC 12 application.

Currently Seasonair does not have the necessary equipment needed to produce the HFC 134a condensers. The existing equipment used for CFC 12 MAC production cannot be retrofitted to perform similar function for HFC 134a MAC production. Therefore, Seasonair needs to procure the following specific equipment for the conversion purpose:

Table 3.3: List of New Equipment Required for the Conversion Process

NO.	MACHINE NAMES	DESCRIPTIONS
1.	T-DRILL TUBE CUT OFF AND END FORMING MACHINE	For chipless parting, straightening of tubings and end forming for HFC 134a application
2.	T-DRILL TUBE COLLARING MACHINE	For making precision holes and collaring on pipe for the assembly of service ports for charging of HFC 134a refrigerant & system maintenance
3.	FIN POWER HOSE CLAMPING MACHINE	For clamping of Aluminium HFC 134a pipe fitting to the flexible hose
4.	TUBE BENDING MACHINE	For bending tubes and piping for assembly of MAC systems
5.	TRUMPF TC-2000R SHEET METAL PUNCHING MACHINE	For making & forming metal parts for the modification of HFC 134a component mounting bracket
6.	BRAZING FURNACE	For automatic controlled atmosphere brazing
7.	CORE BUILDER MACHINE	For the assembly of fins & header before brazing
8.	FIN FORMING MACHINE	For forming fins of condensers
9.	TOOLING – HEADER SPACER/ END CAP	For welding & sealing of headers

10.	STAINLESS STEEL JIGS AND TOOLINGS	For positioning the tubes & fins during brazing

NOTES:

(a) Item (1) - (5) had already been procured by local term financing and currently are used for production of CFC 12 MAC System in Seasonair's factory. A retroactive funding is therefore requested for them. This equipment will be adjusted to support the main line to be purchased for the production of HFC 134a MAC system.

(b) Item (6) - (10) are new specific equipment, which Seasonair needs to procure for complete conversion to HFC 134a MAC System production. A progressive funding is therefore applied for the procurement of these equipment.

The aluminium brazing process has been developed by Alcan, under the trademark "NOCOLOK®", as a non-corrosive flux brazing process which has been proven and is now widely accepted by the MAC Industry.

As a result of the proposed changes in the heat exchanger production line which will enable Seasonair to produce parallel-flow heat exchangers that are suitable for HFC-134a MAC systems.

Seasonair is requesting for financial assistance from the Multilateral Fund of the Montreal Protocol, which is meant for the purchase of the above equipment, so that Seasonair can realize the conversion of its heat exchanger production by the end of year 2003.

5. JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

HFC-134a is widely accepted among the automotive industry as the most viable alternative refrigerant for CFC-12 for use in MACs. HFC-134a is a zero ODP alternative. HFC 134a is a common alternative refrigerant used by all other similar ODS phase-out projects in MAC sector in Malaysia (Denso, UCM, APM, PATCO and Sanden).

6. PROJECT COSTS

6.1 Total Project Cost

As described below, and detailed in the relevant annexes, the total project costs over the first four years of the project (investment costs) is **US$ 3,179,185.**

Investment Costs: Investment (capital) costs of **US$ 2,944,805** incurred by the enterprise, are detailed in Annex 1. The costs include the equipment already purchased by the enterprise as well as the equipment to be purchased upon approval of the applied financial assistance from the MLF. However, the amount requested is capped based on the funding levels approved to similar equipment items in other previously approved projects. Therefore, the total request for investment cost is **US$1,149,720**.

Net Incremental Operating Costs: No net incremental operating costs are requested by the enterprise.

Local Ownership Fraction: Since the enterprise is 100% locally owned, there will be no deduction in terms of percentage of ownership.

Contingencies: A 10 percent Contingencies of Capital Investment (**US$ 110,220**) is also included to ensure adequate funding of project costs following project appraisal. These contingencies exclude the value of the Technical Assistance Fee (Item E14 in Annex 1).

6.2 Calculation of Incremental Operation Cost

Not applicable.

6.3. Cost Effectiveness (CE)

Please refer to Annex 3

6.4 Proposed Multilateral Fund Grant

The total funding request for this project is US$1,259,940 of which, US$110,220 is requested as a contingency budget.

7.0 PROJECT IMPLEMENTATION

This conversion project will be extensively implemented upon a period of 2 years after the approval of the ExCom. It is targeted to be fully operational and running by the end of 2003.

A Project Implementation Chart is given on the next page.

7.1 Milestones for Project Monitoring

In conformity with the Executive Committee's decision 23/7 on standard components on monitoring and evaluation, prescribed milestones for project monitoring is provided as below. The following project milestones for project monitoring are indicated by the number of months from the project approval until full completion of the particular component:

TASK DESCRIPTIONS	MONTH*
(a) grant agreement submitted to beneficiary	**February 2002**
(b) grant agreement signature	**March 2002**
(c) bids prepared and requested	**April 2002**
(d) contracts awarded	**July 2002**
(e) equipment delivered	**December 2002**
(f) commissioning and trial runs	**March 2003**
(g) de-commissioning and/or destruction of redundant baseline equipment	**December 2003**
(h) submission of project completion report (needed to satisfy the requirements for project completion reports)	**June 2004**

*Indicate the last month of quarter given on the Implementation Chart

Table 7.1 Project Implementation Schedule

TASKS	1998		1999				2000				2001				2002				2003			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. a) MLF approval and funding																						
b) Financial Appraisal																						
c) Sub-grant Agreement																						
d) Security creation																						
e) Procurement preparation																						
f) Vendor Selection																						
2. a) Equipment delivery																						
b) Installation and Commissioning																						
c) Plant modifications																						
3. a) Trials and Start-up																						
b) Training/Certification																						
4. a) De-conversion*																						
b) First disbursement																						
c) Last disbursement																						
d) Completion report preparation/submission																						

8. PROJECT IMPACT

Upon full completion by the end of year 2003, this conversion project will result in an indirect phaseout of 49 ODP tons of CFC-12.

ANNEX 1

INCREMENTAL CAPITAL COSTS

No	Item/Description	Unit Cost	Qty	Cost (US$)	Requested Amount (US$)
A. Condenser Assembly Section					
1	Brazing Furnace	956,175.00	1	956,175	478,090
2	Core builder machine	432,368.00	1	432,368	190,000
3	Fin forming machine	376,224.00	1	376,224	304,000
4	Tooling - header spacer/end cap	153,000.00	2	306,000	7,600
			Sub-total	***2,070,767***	***979,690***
B. Condenser Brazing Section					
5	Stainless steel jigs and tooling	45	600	27,000	27,000
			Sub-total	***27,000.00***	***27,000***
C. Additional Supporting Equipment*					
6	T-Drill Tube Cut Off And End Forming Machine	120,000.00	1	120,000	
7	T-Drill Tube Collaring Machine	68,000.00	1	68,000	
8	Fin Power Hose Clamping Machine	42,000.00	1	42,000	
9	Tube Bending Machine	181,000.00	1	181,000	
10	Trumpf TC-2000R Sheet Metal Punching Machine	190,000.00	1	190,000	
			Sub-total	***601,000***	***0***
D. Other Costs					
11	Freight and insurance			80,000	30,200
12	Installation Cost (5% of equipment cost)			103,538	50,330
13	Scrap value (Scrap value associated with condenser manufacturing equipment to be replaced following conversion). [2]			N/A	
			Sub-total	***183,538***	***80,530***
E. Technology Transfer Agreement & Training					
14	Technology Transfer from Arup GmbH			47,500	47,500
15	Overseas Training			15,000	15,000
			Sub-total	***62,500***	***62,500***
			TOTAL	**2,944,805**	**1,149,720**
			10% Contingency	**234,380**	**110,220**
			GRAND TOTAL	**3,179,185**	**1,259,940**

***** Equipment under Item C were already procured. No funding from the MLF is requested.

ANNEX 2

INCREMENTAL OPERATING COSTS

There are no incremental operating costs.

ANNEX 3

COST EFFECTIVENESS

ODP Impact of the project:

Substance	**ODP**	**Consumption**	**MT ODP**
CFC 12	1.0	49 MT ODS	49 MT ODP

ODP savings from the project	:	49 MT ODP
Remaining ODP consumption at the enterprise	:	0.0 MT ODP
A. Incremental Capital Costs	:	US$ 1,259,940.00
B. Incremental Operating Costs (6 months) (MLF funding not requested for this component)	:	US$ -
C. Total Incremental Project Costs (A+B)	:	US$ 1,259,940.00
D. Costs pro-rated for Non-Article 5 ownership*	:	100% locally owned
E. Eligible MLF grant funding (C-D) (Capital Cost only)	:	US$ 1,259,940.00
F. Total ODS phased out (based on net ODP value)	:	Kg/y 49,000.00
Cost Effectiveness (E/F)	:	US$ 25.71 kg/y
Threshold for Sector	:	-

ANNEX 4

ENVIRONMENTAL ASSESSMENT

The following licenses and approvals will be asked for. If relevant, should address the following:

1. HFCs Global Warming Impact
2. Additional energy consumption
3. HCFCs consumption

Seasonair has obtained all the necessary licenses such as pollution control approval etc. for its existing operations. Modifications, if any, shall be applied for as and when necessary.

ANNEX 5A

ENTERPRISE BASELINE INFORMATION AND DISPOSAL PLAN

LIST OF BASELINE EQUIPMENT

Description	Unit	Supplier	Model	Specification	Date of Manufacture	Serial Number
Fin Press Machine*	1	Firm Group Co. Ltd. Thailand	N. A	60 ton	1990	N. A
Vertical Expander*	1	Firm Group Co. Ltd. Thailand	LPC 835	50 ton	1990	N. A
Press for Tube Sheet*	1	Firm Group Co. Ltd. Thailand	N. A	30 ton	1990	N. A
Tube Sheet Forming*	1	Firm Group Co. Ltd. Thailand	N. A	30 ton	1990	N. A
Manual Tube Bender*	1	Firm Group Co. Ltd. Thailand	N. A	Manual	1990	N. A

*Components of Condenser Assembly Line with production capacity of 120,000 units per annum

Disposal Plan of Baseline Equipment

Description	Unit	Supplier	Model	Date of Manufacture	Serial Number	Disposal
Fin Press Machine	1	Firm Group Co. Ltd. Thailand	-	1990	N. A.	December 2002 Scrapped
Vertical Expander	1	Firm Group Co. Ltd. Thailand	LPC 835	1990	N. A.	December 2002 Scrapped
Press for Tube Sheet	1	Firm Group Co. Ltd. Thailand	-	1990	N. A.	December 2002 Scrapped
Tube Sheet Forming	1	Firm Group Co. Ltd. Thailand	-	1990	N. A.	December 2002 Scrapped
Manual Tube Bender	1	Firm Group Co. Ltd. Thailand	-	1990	N. A.	December 2002 Scrapped

ANNEX 5B

SESONAIR FACTORY LAYOUT

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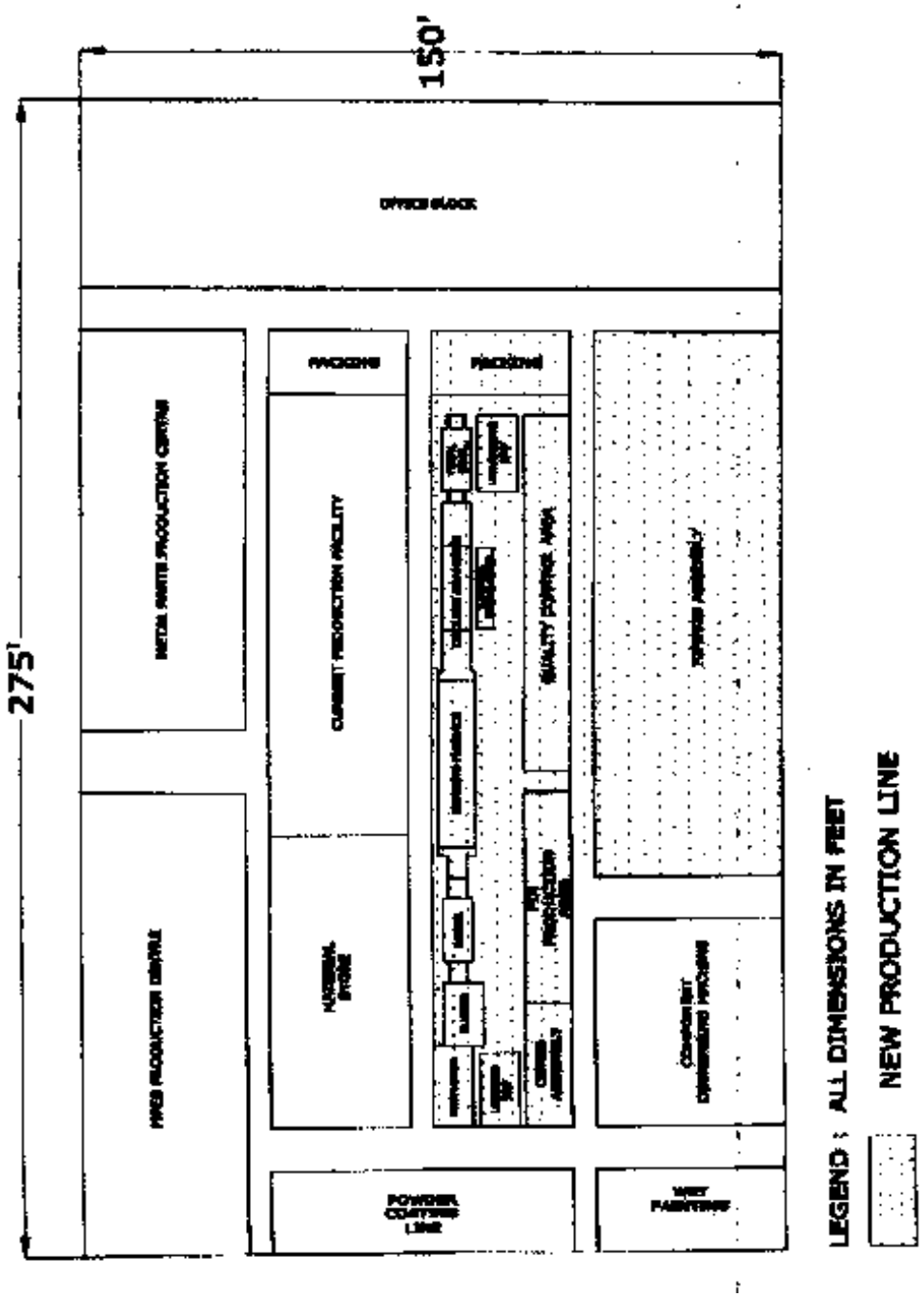
SEASONAIR FACTORY LAYOUT FOR NEW PF PRODUCTION LINE (GROUND FLOOR)



ANNEX 6

LETTER OF COMMITMENT FROM ENTERPRISE

SEASON™

SEASONAIR (M) SDN. BHD.
(207592-K)
Lot 4, Jalan Ipoh, Bt. 18, Rawang Industrial & Housing Estate,
Taman Rawang Perdana, Rawang, 48000 Selangor Darul Ehsan, Malaysia.
Tel : (603) 692 7519 (Hunting Line) Fax (603) 692 1524/26
E-mail: seasonair@tm.net.my
Home Page : http://seasonair.com

ANNEX 7

Ref No 491/07/2000/jl

24 July, 2000

DIRECTOR - GENERAL
DEPARTMENT OF ENVIRONMENT
MINISTRY OF SCIENCE,
TECHNOLOGY AND THE ENVIRONMENT
12th & 13th FLOOR, WISMA SIME DARBY
JALAN RAJA LAUT
50662 KUALA LUMPUR
TEL. 03-294 7844
FAX. 03-293 1480

ATTN: PUAN HAJAH ROSNANI BT. IBARAHIM

RE: ODS PHASE-OUT PROJECT AT SEASONAIR (M) SDN. BHD., LOT 4, JALAN IPOH, BT. 18, RAWANG INDUSTRIAL & HOUSING ESTATE, TAMAN RAWANG PERDANA, 48000 RAWANG, SELANGOR DARUL EHSAN, MALAYSIA.

Dear Sir/Madam,

In connection with our request for "Montreal Protocol - ODS Phase-out Investment Project Grant", we would like to state the followings:

If ever our total project cost exceeds the approved OTF Grant amount, the following options are considered to cover the shortfall or difference for the implementation of the said project:

1. Plowing back of any fund surplus of the company derived from internal source, and
2. Loan from an approved bank by utilizing our existing line of credit for any additional amount needed if item No. 1 is not sufficient to cover the difference.

We trust the above suffice your requirement

Yours faithfully,
SEASONAIR (M) SDN BHD (207592-K)

Director

Peter Liow
(Managing Director)

COUNTRY OF ORIGIN: Malaysia

IMPLEMENTING AGENCY: The World Bank

PROJECT TITLE: Replacement of CFC-12 refrigerant with HFC-134a in the production of Mobile Air-Conditioning Systems at Seasonair (M) Sdn. Bhd.

PROJECT DATE: September 10, 2001

SECTOR: Mobile Air Conditioning

RELATIONSHIP TO COUNTRY PROGRAM: The Malaysian government considers this project important to the success of the Malaysian National CFC Phaseout Plan and, accordingly, has asked the MLF for funding approval. In return, the government would be both able and willing to ban CFC's in commercial MAC systems by the end of 2004.

PROJECT SUMMARY: Seasonair wishes to convert production from Tube & Fin Condensers currently manufactured for CFC-12 commercial vehicle system use to Parallel Flow Condensers appropriate for use with non-ozone depleting HFC-134a MAC systems. The request is for support funding to purchase equipment and technology transfer for the manufacturing plant conversion.

ENVIRONMENTAL IMPACT: The conversion of Seasonair condensers to parallel tube construction does not, in itself, guarantee any reduction in CFC use because parallel tube condensers can be used in both CFC-12 and HFC-134a systems. However, such conversion is supports, and is in accord with, the proposed concomitant banning of CFC systems in new commercial vehicles which would result in the reduced demand for CFC noted in the proposal.

PROJECT COSTS: Project costs and standard costs seem reasonable and funding requested is necessary and appropriate for the intended plant conversion from Tube & Fin to Parallel Flow Condensers.

IMPLEMENTATION TIMEFRAME: The project timeframe appears workable.

RECOMMENDATION: The conversion requested falls within the OORG MACS guidelines and the recommendation is to proceed with the request for funding.

OORG REVIEWER: James A. Baker

DATE OF REVIEW: September 12, 2001