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DU FONDS MULTILATÉRAL AUX FINS
D'APPLICATION DU PROTOCOLE DE MONTRÉAL
Quarante et unième réunion
Montréal, 17 - 19 décembre 2003

PROPOSITION DE PROJET : REPUBLIQUE ISLAMIQUE D'IRAN

Le présent document comporte les observations et les recommandations du Secrétariat du Fonds sur la proposition de projet suivante :

Élimination :

• Plan national d'élimination du CFC (premier programme annuel de mise en œuvre)	Allemagne, France, Japon, PNUD, PNUE, ONUDI

FICHE D'EVALUATION DU PROJET
IRAN

SECTEURS : Élimination Consommation sectorielle de SAO (2001) : 4 221 tonnes PAO

Seuil de coût-efficacité : 10 $US/kg

Titres des projets :

a) Plan national d'élimination du CFC (premier programme annuel de mise en œuvre)

Données du projet	**Multiple**					
	Plan national					
Consommation de l'entreprise (tonnes PAO)	1 708,4					
Incidence du projet (tonnes PAO)	1 708,4*					
Durée du projet (mois)	84					
Montant initial demandé ($US)	265 470	161 584	135 607	415 397	213 000	490 984
Coût final du projet ($US) :	6 162 072	1 615 835	2 009 068	2 116 180	213 000	5 019 430
Surcoûts d'investissement (a)						
Coût d'imprévus (b)						
Surcoûts d'exploitation (c)						
Coût total du projet (a+b+c)						
Participation locale au capital (%)	100					
Élément d'exportation (%)	0					
Montant demandé pour la première tranche ($US)	265 470	161 584	135 607	415 397	213 000	490 984
Rapport coût-efficacité ($US/kg)	10,00**					
Financement de contrepartie confirmé ?						
Agence nationale de coordination	Centre de protection de la couche d'ozone, Service de l'environnement					
Agence d'exécution	Allemagne	France	Japon	PNUD	PNUE	ONUDI

Recommandations du Secrétariat						
Montant recommandé ($US)						
Incidence du projet (tonnes PAO)						
Rapport coût-efficacité ($US/kg)						
Coût de soutien à l'agence d'exécution ($US)						
Coût total pour le Fonds multilatéral ($US)						

* L'incidence totale du projet est 1 708,4 tonnes PAO. L'incidence de la première tranche est 0 tonnes PAO.

** Rapport coût-efficacité du plan d'élimination.

DESCRIPTION DU PROJET

Données générales sur le secteur

Profil de consommation et d'élimination des CFC (Groupe I de l'Annexe A)

L'Iran a choisi l'Option 2 de la Décision 35/37 pour définir le point de départ, qui s'élève à :	**1 708,4 tonnes PAO**
- Consommation restante de CFC admissible aux fins de financement au moment de la 41e réunion (Décision 35/57, condition B)	1 708,4 tonnes PAO
- Incidence de TOUS les projets sur les CFC ayant fait l'objet de demandes de financement à la 41e réunion	1 708,4 tonnes PAO
- Consommation restante de CFC admissible aux fins de financement suite à l'approbation des projets soumis à la 41e réunion	0 tonne PAO
Consommation de CFC déclarée pour 2002	4 437,8 tonnes PAO

1. Le gouvernement allemand a soumis à la 41e réunion un plan national d'élimination du CFC pour le compte du gouvernement de la République islamique d'Iran.

2. Ce plan national d'élimination du CFC contribuera à l'élimination finale du CFC dans le pays d'ici 2010 et aidera le gouvernement de la République islamique d'Iran à atteindre ses objectifs de consommation de CFC d'ici 2005 et 2007.

3. La Décision 38/55 prise à la 38e réunion du Comité exécutif demandait au gouvernement de la République islamique d'Iran de préparer un plan national d'élimination du CFC qui identifie et explique clairement la consommation de CFC de divers secteurs et sous-secteurs ainsi que les différences entre ces chiffres et ceux précédemment communiqués. Cette décision a guidé le processus de préparation du plan national d'élimination.

4. Ce plan est une proposition d'élimination du CFC fondée sur les résultats servant de base à un accord entre le gouvernement de la République islamique d'Iran et le Comité exécutif. Une copie du plan figure en annexe du présent document (les annexes du plan sont disponibles sur demande).

5. Le plan national d'élimination repose sur les études et projets existants concernant les sous-secteurs des mousses, des solvants et de la fabrication et de l'entretien des équipements de réfrigération. Il comprend des informations détaillées sur tous les secteurs couverts, intègre toutes les études sectorielles existantes et définit une stratégie globale en vue de son application coordonnée. Une consommation totale de 1 708,4 tonnes PAO de substances inscrites au Groupe I de l'Annexe A sera éliminée dans le cadre de ce programme, qui comprend des projets d'investissement approuvés mais non achevés. Le gouvernement allemand a déterminé que le financement sollicité est conforme aux règles et directives existantes du Comité exécutif.

6. Il est indiqué que le plan national d'élimination clarifie l'état de la consommation de CFC dans le pays, sa répartition entre sous-secteurs et l'allocation de la consommation restante admissible aux fins de financement à des projets et activités. Le plan utilisera un ensemble de politiques, de réglementations et d'incitations financières pour appuyer l'élimination dans divers secteurs industriels. La proposition comprend également les volets d'assistance technique nécessaires pour renforcer la capacité de l'industrie et des organismes concernés en matière d'investissement, de réglementation, de sensibilisation et de participation du public.

7. Le plan propose une stratégie de gestion et de mise en œuvre, comprenant un programme de suivi, destinée à garantir l'application effective de ce programme d'élimination du CFC. Les crédits alloués seront liés à la réalisation effective des objectifs de réduction de la consommation de CFC.

8. Le plan national d'élimination comprend des plans d'action concernant les six volets suivants :

- Élimination du CFC-113;
- Élimination de la consommation restante dans le secteur des mousses;
- Élimination de la consommation restante de CFC dans le sous-secteur de la fabrication et de l'assemblage d'équipements de réfrigération;
- Élimination du CFC dans le sous-secteur de l'entretien des équipements de réfrigération et des climatiseurs;
- Élimination du CFC dans le sous-secteur de l'entretien des climatiseurs d'automobile; et
- Assistance technique et renforcement des capacités en matière de mise en œuvre et de suivi des projets;

9. Le champ d'application de chacun des ces volets est décrit en détail dans le plan national d'élimination. Le coût total estimé de l'élimination, de l'assistance technique et du suivi des projets s'élève à 18,775 millions $US, dont 1,639 $US de commission de gestion.

10. Le gouvernement allemand est la principale agence d'exécution du plan et travaille en collaboration avec le gouvernement français, le gouvernement japonais, le PNUD, le PNUE et l'ONUDI. Il sera responsable d'un ensemble d'activités détaillées dans le plan et associées à la gestion financière et logistique de sa mise en œuvre, à la coordination des organismes et institutions concernées et à la réalisation du suivi et des comptes rendus requis.

11. La répartition du financement et la fourniture d'assistance technique aux entreprises reposeront sur les demandes des entreprises consommatrices de CFC. Les modalités d'exécution du plan national d'élimination du CFC exigent des entreprises qu'elles soient actives et soumettent des demandes de financement conformes aux règles et directives définies dans le cadre du programme ainsi qu'aux politiques de financement du Fonds multilatéral.

12. La gestion et le suivi utiliseront plusieurs indicateurs de performance :

- Réalisation des objectifs d'élimination du CFC;

- Progrès enregistrés par rapport aux objectifs;
- Achèvement des projets inclus dans le plan;
- Durabilité des activités entreprises dans le cadre du plan;
- Conversions complètes des entreprises à des technologies sans CFC;
- Efficacité de la formation et de l'assistance technique;
- Réalisation des objectifs d'élimination du CFC;
- Suivi continu de la consommation de CFC (mesures et base de données).

Les comptes rendus utiliseront des indicateurs quantifiables des progrès réalisés.

OBSERVATIONS ET RECOMMANDATIONS DU SECRETARIAT

OBSERVATIONS

13. Le Comité exécutif a approuvé 105 projets d'investissement visant à éliminer 5 231,8 tonnes PAO utilisées dans les secteurs consommateurs de CFC en Iran. Environ 57,5 millions $US ont été alloués à la mise en œuvre de ces projets. La consommation totale de CFC déjà éliminée et celle qui sera éliminée dans le cadre des projets en cours, y compris le plan national d'élimination proposé, dépassent la consommation de référence de 52 pour cent. Le Secrétariat a analysé les modes de consommation de CFC au cours du temps en Iran en utilisant les données fournies dans le plan national d'élimination et celles de la base de données du Secrétariat telles que la croissance du PIB, le volume cumulé de CFC et de substances de remplacement par secteur manufacturier et utilisateurs finaux, les taux de croissance de la production dans les entreprises converties aux technologies sans CFC, etc. Le Secrétariat a conclu de cette analyse qu'il est possible qu'il y ait eu des erreurs lors de la collecte des données de consommation de CFC et que cette consommation ait pu être surestimée dans le passé. Le gouvernement allemand a déclaré que les données communiquées sont aussi précises que possible étant donné la situation actuelle du pays, en transition d'une économie centrale planifiée vers une économie de marché. Il a précisé que les données actuelles de consommation de CFC reposent sur plusieurs études récentes réalisées dans un grand nombre de secteurs et sous-secteurs industriels et d'utilisateurs finaux. Il a émis l'opinion que ces données peuvent être utilisées avec un haut degré de confiance dans le cadre de la réalisation des objectifs du plan national d'élimination.

14. Les données recueillies du secteur iranien de la réfrigération ont depuis longtemps manqué de cohérence. Ces incohérences concernent les informations fournies au Secrétariat par les agences d'exécution au cours des quatre dernières années au sujet du nombre d'entreprises du secteur et de leurs nom, lieu d'implantation, niveau de production, consommation de SAO, date de constitution et classification (sous-secteur). Plusieurs études ont été réalisées par les agences d'exécution et le Service national de l'ozone pour clarifier ces problèmes. De nombreux tableaux ont été préparés, répertoriant des centaines d'entreprises par catégories et groupes. Les résultats n'ont toutefois pas été concluants.

15. Le plan tente de s'attaquer à la question de l'incohérence des données du secteur de la réfrigération. Une nouvelle étude réalisée dans le cadre de la préparation du plan sectoriel a

recensé 92 entreprises du sous-secteur de la fabrication d'équipements de réfrigération admissibles à un appui du Fonds multilatéral avec une consommation totale de 494 tonnes PAO. D'autre part, 58 entreprises jusqu'alors non inventoriées et représentant une consommation de CFC de 137 tonnes PAO ont été recensées dans le secteur de l'assemblage et du chargement d'équipements de réfrigération. Suite à des discussions avec le gouvernement allemand, il a été convenu que la consommation restante admissible du sous-secteur de la fabrication d'équipements de réfrigération, qui entre dans le calcul des surcoûts, soit maintenue à 55.0 tonnes PAO, conformément à l'accord conclu lors des consultations avec les agences d'exécution, le Service national de l'ozone et le gouvernement de la République islamique d'Iran annoncé lors de la 35e réunion du Comité exécutif.

16. Il a par ailleurs été convenu de reconnaître la disponibilité de la consommation de 135 tonnes PAO par les petites entreprises de réfrigération. Il a été convenu d'aborder cette consommation en fournissant les financements nécessaires par le biais d'une assistance technique au sous-secteur de l'entretien des équipements de réfrigération.

17. La consommation déclarée de 40 tonnes de CFC-113 identifiée dans le secteur des solvants concerne la vieille chaîne de production de compresseurs de l'usine ICMC. Un projet de conversion de cette usine a été approuvé à la 27e réunion du Comité exécutif, avec l'ONUDI comme agence d'exécution. Le gouvernement iranien est convenu de ne pas demander l'assistance du Fonds multilatéral concernant cette chaîne de production. La consommation de CFC-113 ne semble donc pas admissible à un appui financier.

18. Le Secrétariat a souligné l'importance de créer le plus tôt possible un système de permis et de contrôle et a demandé au gouvernement allemand des précisions sur les dates prévues pour la mise en place de ce système. Le Secrétariat a été informé que le système de permis a été élaboré avec l'assistance d'un expert indien dans le cadre d'une coopération Sud-Sud financée par le PAC du PNUE. La réglementation régissant les permis devrait être promulguée d'ici le 31 octobre 2003. Aucune confirmation à cet égard n'avait été reçue au moment de la rédaction du présent document.

19. Il est indiqué dans différentes sections du plan que d'autres projets sont prévus dans les secteurs des aérosols à usage médical (inhalateurs à doseur) et des solvants. Le Secrétariat a observé que la proposition est présentée comme un plan visant l'élimination totale en Iran des substances inscrites au Groupe I de l'Annexe A (CFC). Le projet d'accord fourni par le gouvernement allemand précise qu'il s'agit du financement total mis à la disposition de la République islamique d'Iran par le Fonds multilatéral en vue de l'élimination totale du CFC dans ce pays. De même, l'élimination proposée tient compte de la consommation totale de CFC déclarée pour l'Iran. Le Secrétariat a indiqué au gouvernement allemand que les projets supplémentaires susmentionnés, en cours d'examen en vue de leur soumission future, ne seraient alors pas admissibles à un appui financier. En guise de réponse, le gouvernement allemand a précisé que le gouvernement de la République islamique d'Iran était convenu d'exclure les demandes de financements relatives aux inhalateurs à doseur du plan national d'élimination. Le gouvernement allemand a toutefois maintenu ce volet dans le plan en tant que base de discussion concernant les futures demandes de financement potentielles.

20. Une proposition relative à la conversion de compresseurs figure dans la liste des principaux volets du plan national d'élimination avec la note de bas de page suivante : « Le gouvernement de la République islamique d'Iran et le gouvernement japonais envisagent l'inclusion de la conversion de la société Pars de fabrication de compresseurs dans le plan d'activité du Japon, aucun financement n'est sollicité à ce stade » (Page 51). Dans ses observations communiquées au gouvernement allemand, le Secrétariat a fait observer que le plan d'élimination proposé tient compte de la consommation totale déclarée de CFC en Iran et que les termes du projet d'accord indiquent clairement que les projets futurs ne seront pas admissibles à un financement. Le Secrétariat a invité le gouvernement allemand à réviser le plan national d'élimination en conséquence.

21. Le niveau de surcoût admissible à un financement et le projet d'accord entre le Comité exécutif et le gouvernement de la République islamique d'Iran sont en cours d'examen par le Secrétariat et le gouvernement allemand. Les résultats de ces délibérations seront communiqués avant la réunion du Sous-comité sur l'examen des projets s'il y a lieu.

RECOMMANDATIONS

22. En attente.

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MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY	I.R. IRAN	**LEAD IMPLEMENTING AGENCY**	Germany
PROJECT TITLE	**National CFC Phase Out Plan for the Islamic Republic of Iran**		
PROJECT IN CURRENT BUSINESS PLAN	Yes		
SECTOR	CFC Phase Out		
SUB-SECTOR	All		

ODS USE IN SECTOR	Baseline (Average of 1995-97)	4,157	ODP T
	Current (2001)	4,221	ODP T
	From approved ongoing projects	2,448	(ongoing at the 38th meeting)
	From remaining fundable consumption	1,708.4	ODP T
	From remaining eligible enterprises	2,016.4	ODP T
	Net covered by this Plan	**1,708.4**	**ODP T**

PROJECT IMPACT	**Total Phase out of 2016.4 ODP tonnes of which 1,708.4 are fundable**
PROJECT DURATION	7 years
LOCAL OWNERSHIP	100%
EXPORT COMPONENT	0%

REQUESTED GRANT	US$	17,135,585
COST EFFECTIVENESS	US$/kg	10.0
IMPLEMENTING AGENCIES SUPPORT COSTS	US$	1,639,428
TOTAL COST OF PROJECT TO MULTILATERAL FUND	US$	18,775,013

IMPLEMENTING AGENCIES	GTZ (Lead), UNDP, UNEP, UNIDO, France, Japan
STATUS OF COUNTERPART FUNDING	N/A
PROJECT MONITORING MILESTONES	Included
NATIONAL COORDINATING BODY	Ozone Layer Protection Center, Department of Environment

PROJECT SUMMARY

This project will phase out all the remaining CFC consumption in the in the I.R. Iran upon completion and assist Iran in finally meeting its Montreal Protocol obligations. The National CFC Phase-out Plan forms the basis for a performance based agreement between the Government of the I.R. of Iran and the Executive Committee of the Multilateral Fund of the Montreal Protocol.

The agreement will regulate conditions and obligations for the total phase out of a remaining 2,016.4 ODP tonnes consumption of CFCs from eligible uses in the countries, of which 1,708.4 ODP tonnes have been established fundable according to the selection of option 2 under decision 35/57 (excluding MDIs). There is also a significant amount of ineligible consumption in the country which will disappear with the increasing implementation and enforcement of the proposed regulatory and legislative action. Considering the complicacy of such approach, it is crucial that flexibility is given to the Iranian Government to adapt or modify its strategies during implementation of this plan as needs arise.

The activities will be implemented through seven annual implementation Programs and together with the implementation of the approved ongoing projects complete CFC phase out will be achieved by end of 2009.The total eligible incremental costs and the requested grant for the National Phase out Plan are US$ 17,135,585, the overall cost-effectiveness of this National CFC Phase-out Plan is 10.0 US$/Kg ODP.

The government of Iran has requested the GTZ to be the lead agency for the overall coordination and implementation of the NPP. The implementation of sector action plans will be carried out by altogether six organisations, UNDP, UNIDO, UNEP, Germany (GTZ), France (AFD) and Japan. The funding is requested in annual allocations starting in 2003 and over a seven-year period 2004 - 2010. The individual sector action plans propose an effective combination of investment, non-investment, technical assistance, and capacity building activities. Without the approval of this plan the I.R. of Iran will not able to meet its compliance targets in 2005 and 2007.

PREPARED BY	J.Usinger for GTZ in consultation with the NOU and all participating agencies	**DATE**	September 2003
REVIEW BY	C. Murdoch/D. Gibson	**DATE**	September 2003

gtz

National CFC Phase Out Plan for the Islamic Republic of Iran

PHASE OUT OF CFCs IN ALL SECTORS

prepared by
The Department of Environment,
Human Environment Affairs, Iran

in cooperation with the lead agency
Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), financed by
Federal Ministry For Economic Co-Operation And Development (BMZ), Germany

and the co-operating agencies
France, Japan, UNIDO, UNDP, UNEP

PART I MAIN DOCUMENT

September 10, 2003

PROPOSAL TO BE SUBMITTED FOR THE 41ST MEETING OF THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND OF THE MONTREAL PROTOCOL

LIST OF ACRONYMS

AFD	Agence Francaise de Development
CP	Country Program
CPU	Country Program Update
DoE	Department of Environment
ExCom	Executive Committee of the Multilateral Fund
GTZ	Deutsche Gesellschaft fuer Technische Zusammenarbeit
IA	Implementing Agencies
IFTAP	Iranian Foam Training Assistance Program
MAC	Mobile Air Conditioning (MAC)
MACTIP	MAC Training and Incentive Program
MB	Methyl Bromide
MLF	Multilateral Fund of the Montreal Protocol
MP	Montreal Protocol
MSE	Micro and Small Enterprises
NOU	National Ozone Unit
NPP	National CFC Phase-out Plan
NOC	National Ozone Committee
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substances
RMP	Refrigeration Management Plan
REFTAP	Refrigeration Technical Assistance Program
SME	Small and Medium Enterprises
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
UNEP	United Nations Environment Program

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PART I MAIN DOCUMENT

PART II ANNEXES (separate Document)

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1 INTRODUCTION

1.1 Program Objective

The National CFC Phase out Management Plan (NPP) for all CFCs will lead to the final phase out of CFCs in the country by 2010 and will be crucial to assist the Government of the Islamic Republic of Iran to meet its compliance targets for CFC consumption in 2005 and 2007.

The NPP will provide a performance-based CFC phase-out proposal, which will provide the base for an agreement between the Government of Iran and the Executive Committee of the MF and formalize legally the commitments of both sides.

A total consumption of 1,708.4 ODP tons of Annex A, Group I substances will be phased-out under this Program, including individual investment projects already approved but not yet completed. The preparation of the NPP follows a recommendation of the Excom members at the 38th meeting, which was taken during project review of several individual and sector project proposals. In order to strengthen efforts and coordination of the proposed activities the members recommended to prepare a national CFC phase-out plan, clearly identifying and explaining CFC consumption in various sectors and sub-sectors (UNEP/OzL.Pro/ExCom/38/14). Activities should be presented in the scope and relevance of Iran's efforts to reach compliance and final phase out at the end of 2009.

Therefore the NPP is build on the existing sector surveys and plans for the foam, solvent, refrigeration servicing and manufacturing sector. It includes detailed information on all sectors covered, integrates all existing sector surveys and develops an overall strategy of coordinated implementation.

The requested funding is based on the existing Excom rules and Guidelines, among them namely, Decision 35/56 on terminal phase out plans, Decision 22/23 and Decision 23/16 regarding recovery and recycling projects, Decisions regarding the development of Refrigeration management plans (RMP) including decision 31/48, Decision 31/45 regarding the assembly, installation and servicing of refrigeration equipment (including the refrigeration transportation equipment), Guidelines listed in Document 38/56 and 37/65.

Furthermore it will finally clarify the status of CFC consumption in the country, its breakdown in sub sectors and the allocation of the remaining fundable consumption to projects and activities. The plan will utilize a combination of policies, regulations, and financial support to subsidize fundable phase-out costs in various industrial sectors. The proposal also includes necessary technical assistance components for strengthening the capacity of the industry and concerned agencies to carry out investment, regulations, and public awareness and participation activities.

It also proposes a management and implementation strategy, including a monitoring Program, to ensure the successful and effective implementation of this complete CFC phase-out Program. The monitoring Program is a crucial element for the overall objective of this National CFC Phase-out Plan, as disbursements will be linked to confirmation of achievement of CFC reduction targets. Only with the help of the activities proposed in this plan, Iran can meet its compliance schedule in 2005 and 2007.

1.2 The Montreal Protocol (MP) Obligations

The Islamic Republic of Iran ratified both the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer in March 1990. It has also subsequently ratified the 1990 London Amendment, the 1992 Copenhagen and 1997 the Montreal Amendment of the Montreal Protocol.

The Islamic Republic of Iran is classified as a country operating under Article 5 of the Montreal Protocol of Annex A, Group I. Being only an importer, the Islamic Republic of Iran's consumption level of Annex A Group I CFCs for the year 2000 is 4,156.5 ODP T. The Islamic Republic of Iran's has chosen option 2 according to decision 35/57, which manifests the consumption of the year 2000 as the Starting Point for the determination of the compliance targets and the remaining fundable consumption in the country.

The Islamic Republic of Iran is well within the compliance schedule of the Montreal Protocol and complies so far with the obligations of the Montreal Protocol and its subsequent Amendments. The Islamic Republic of Iran schedules their annual consumption of Annex A Group I substances (CFCs 11, 12, 113, 114, and 115) as follows:

2000 – 2004 Consumption is limited to the average annual consumption in the three years 1995 – 1997 (the "Baseline Consumption"). = 4,571.7 ODP tons

2005 – 2006 Consumption is limited to 50% of the "Baseline Consumption", being 2,285.9 ODP T.

2007 – 2009 Consumption is limited to 15% of the "Baseline Consumption", being 685.8 ODP T.

2010 Zero consumption, final phase out of all CFC.

The I.R. of Iran has been among the most active A5countries in ratifying and enforcing the Vienna Convention, the Montreal Protocol and its amendments. The overview below illustrates the ratification dates and the dates of legal enforcement.

Convention/Protocol &Amendments	Ratified/Accepted	Entry into Force
Vienna Convention	3 October 1990	December 1990
Montreal Protocol	10 October 1990	December 1990
London Amendment	8 August 1997	November 1997
Copenhagen Amendment	8 August 1997	November 1997
Montreal Amendment	17 October 2001	January 2002
Beijing Amendment	Not Ratified Yet	----

Table 1.1 Ratification dates and the dates of legal enforcement

1.3 History of ODS use and demand

The I. R. of Iran does not have any production facilities for CFCs or Halons, and the main consumers mostly import their ODS requirements directly, or purchase them locally from importers. The main ODS user industries are manufacturers of refrigerators, freezers; and foam manufacturers, as well as the service centers and repair shops.

CFC represents 85 % of the countries ODS consumption. No imports for halons were reported in 1991, although small amounts were being used for fire extinguishing applications. The 1993 CP had noted some concerns about under-recording of import data in 1991, which might have distorted the consumption. This apprehension was due to the fact that supply of ODS was available through informal sources only, and some government agencies did not respond to questionnaires distributed for collecting data.

Substances	**1991**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Annex A, Group I: CFCs	**4,780**	**4,150**	**3,965***	**5,890**	**5,575**	**4,405**	**4,169**	**4,221**
Annex A, Group II: Halons	350	50	--	460	380	170	170	170
Annex B, Group II: CTC	50	20	25	120	110	50	50	50
Annex B, Group III: TCA	40	15	10	160	140	60	60	60
Annex E Group I: MB total	100	25	70	70	70	55	100	200

of which: Non-QPS	-	15	42	21.6	28.2	33	22.2	27.6
Total	5,320	4,260	4,070	6,700	6,275	4,740	4,549	4,701

* CFCs consumption data provided by NOU is different from consumption in the ExCom database, where the figure is 5,958.2 tons.
Source of MB data is MLF "Progress of Implementation of Country Program", and covers only Non-QPS use.
Source: NOU Data base.

Table 1.2 ODS Consumption as Reported to the Ozone Secretariat (tons)

The first obligated reporting of CFC by Iran to the MF was 4,750 ODP T in 1991. During the preparation of the country program the future demand projection until 2002 was based on an average annual industrial growth rate of 6.5 %, after having three years of strong growth in line. Thus, the projected demand for 2002 was 7,923 ODP T.

1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
4,495	4,787	5,098	5,430	5,783	6,159	6,559	6,985	7,439	7,923

Table 1.3 Future demand and projection of CFC consumption as of the CP 1991

The reconstruction period after the Iran-Iraq war (1989) was initiated with the first 5-year-plan. The high economic growth rate of 11.7 % in 1990/1991 declined to -1.0 % at the end of the first 5-year-plan indicating the turning point of the first economic cycle after the war (c.f. table 1.4). The second economic cycle started after the crisis of 1995/1996 again with a strong growth in 1996/1997 followed by a weaker decrease and recession at the end of the nineties. The actual average growth rate has been therefore only 4.8 % for the period since the first CP.

90/91	**91/92**	**92/93**	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**
11.7	11.4	6.1	2.3	3.0	-1.0	5.2	2.9	1.6	2.4	5.7	4.7	6.0

Table 1.4 I.R. Iran: Gross domestic product
(1990/91-2002/03; real change, %), EIU 1996; BfAI 2003

As to see from table 1.5 the production of chemicals, rubber, chemical and plastic products developed with a similar cyclical movement: decline in the first half of the nineties after high imports in the early 90s and recovery with the end of the first economic cycle mid of the decade.

Sector/Year	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Chemicals and chemical products	2.2	2.8	4.8	5.4	5.7	7.7	13.9
Annual incline	n.a.	27%	71%	13%	6%	35%	81%
Rubber and plastic products	0.6	0.71	1.03	1.22	1.34	1.7	2.05
Annual incline	**n.a.**	**18%**	**45%**	**18%**	**10%**	**27%**	**21%**

Table 1.5 I.R. Iran: Manufacturing of selected products (value in 000 billion kg),
Source: Chamber of Commerce, Iran, (no reporting of previous years)

The following graph illustrates the correlation between the real growth rate and the reported consumption. However as table 1.5 has shown, the growth in the rubber and plastics sector can be expected to be rather higher than compared to the GDP. It helps to explain deviations between the two. The table also illustrates the originally projected unrestrained growth as laid down in the CP and an adjusted projection adjusted to real growth rates trends.

In the post war period of the early 90s, Iran experienced a financial crisis. In 1996 strong oil prices helped to ease that pressure and the inner economy picked up a remarkable growth. The ongoing introduction of economic reforms was accompanied by a strong policy to reduce foreign imports.

These economic fluctuations may well be one important cause for the variation of imported of CFC in order to satisfy the increased demand for local production. The CFC imports statistics show the same pattern: decline during the first 5-year plan followed by a peak at the beginning of the second

economic cycle 1997 with reduced growth rate to the end of the nineties. E.g. the fast growing automotive sector may well have influenced the high import (consumption) of CFC at the beginning of the second economic cycle. The coherence of CFC projections and GDP development are illustrated in Figure 1.6.

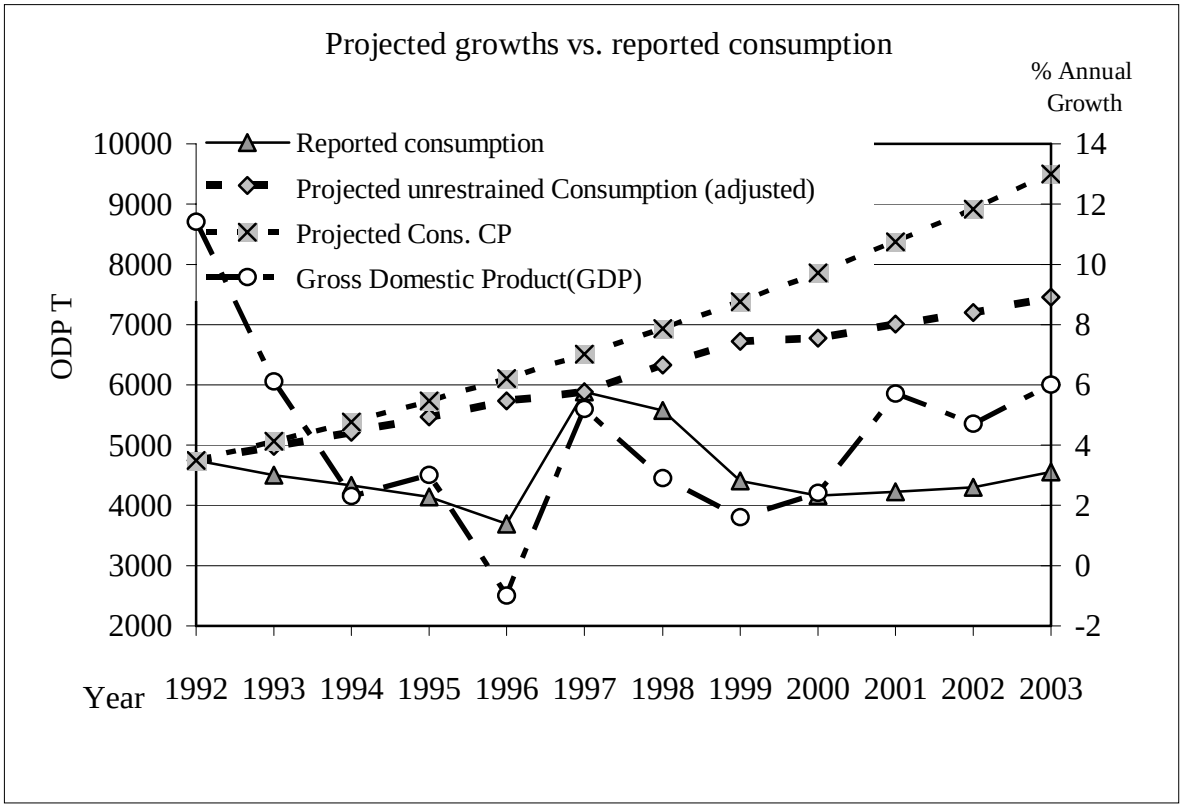


Figure 1.1 Growth projections vs. reported consumption

After a first post-war period of vehicle imports, the Iranian production of vehicles was an important field of industrial recovery (the number of registered vehicles rose from 131,000 in 1993 to more than 2.2 millions in 1996). After the import-period the automotive sector was heavily protected from outside competition with high tariffs and quotas making it practically impossible to import foreign vehicles.

The substitution of car imports required a higher CFC-import needed for automotive part manufacturing in the form of foaming and cleaning agents, and for charging and servicing of MACs. Another factor influencing CFC-consumption and growth is caused by the rapid growth of the (urban) population and their increased needs for appliances and furniture (cooling/fridges, simple mattresses, upholstery). 58.6 % (41 Mio) of the population is living in towns and cities with a population larger than 30,000 (s. Annex I).

The increased demand for CFC produced products resulted in a significant increase of CFC imports after 1996. The history of CFC consumption in Iran is shown in the table below.

Consumption year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
CFCs (ODP T)	4,750	4,750	4,495	4,328	4,140	3,692	5,883	5,571	4,399	4,157

Table 1.6 History of ODS phase-out

The introduction of new economic reforms by the government aimed at a dramatic increase in local production, reduction of the dependency on imports and the privatization of large industrial complexes in the refrigeration and foam sector. This led finally to the establishment of buy-back projects, which allowed again foreign investments in the country from 1999 onwards. One of the

effects was for example; the previously government planned and controlled import of chemicals was left to the decision making of the private sector.

The cyclical developments of the CFC-import and the height at the beginning of the second economic cycle are thus plausible, even though other factors, like the assessment of import figures, customs training, etc. as described under chapter 3. may well have influenced the accuracy and precision of reported data too.

The peaks at the beginning of the economic cycle reflect as well a certain stock-building of CFC in anticipation of the stimulated growth by the 5-year plans. By taking the average of the years 1995-1997 as baseline the extremes from crisis and import-climax of the first and second economic cycle are balanced out. During the second cycle the consumer price inflation was somewhat lower than in the first half of the nineties (average of 30% and 20% respectively) giving a certain support to the demand of CFC-containing consumer goods (vehicles, mattresses, fridges etc.).

1.4 Historical Phase-out Approach

The Iranian Government has worked strenuously and successfully in the past in reducing CFC consumption in all sectors by legislative measures and contributing to protection of the stratospheric ozone layer. For instance, the consumption of CFCs as aerosol propellants (excluding MDIs) has been almost completely phased-out without assistance from the MLF.

All CFC reductions have been funded in the refrigeration manufacturing and foam sector. The total of all CFCs phased out amount to 5,217 ODP T. The total CFC reduction and funding for investment projects are illustrated in the table below.

Sector	No of Projects	Approved funding	Impact
TOTAL		**41,324,082**	**5,217.0**
Refrigeration		**30,795,268**	**2,703.6**
Manufacturing		30,656,668	2,703.6
Domestic	29	16,155,995	1,476.6
Commercial	45	11,850,062	1,107.9
Domestic/Commercial	9	1,490,463	119.1
Assembly			
Compressor	1	1,160,148	
Dom/Com Servicing			
MAC	1	138,600	

Foam	**25**	**10,528,814**	**2,513.4**
Rigid	9	3,801,136	1395.6
Moulded/Integral	6	2,078,648	185.3
Flexible Slabstock	10	4,649,030	932.5

Table 1.7 Total CFC reduction and funding for investment projects

The majority of the projects approved in so far (with the exception of three projects) were individual projects. Iran's phase out efforts started with the largest industrial consumers in the refrigeration and foam industries. Because of the largely developed industrial sector the number of enterprises that had to be converted was significantly high. Only five major domestic refrigerator manufacturers (Arj, Azmayesh, Bahman, Iran Poya, and Pars Appliance), produce 70% of total market share of domestic refrigerators and freezers in Iran.

The following table summarises the subsector division of CFC 11 and CFC 12 use of all approved projects.

SECTOR	**Total ODP tons**	**CFC 11 ODP tons**	**CFC 12 ODP tons**
Foam sector			
Flexible slabstock	932.5	932.5	0
Integral /Molded foam	185.3	185.3	0
Rigid	1,395.6	1,395.6	0
Refrigeration Sector			
Commercial Refrigeration Manufacturing	1,108.0*	710.6*	397.4*
Domestic Refrigeration Manufacturing	1,476.6	1,116.7	359.9
Domestic/commercial Refrigeration	119.1	75.9	43.2
TOTALS	**5,217.0**	**4,416.6**	**800.5**

Table 1.8 Subsector consumption (*Excl. cancelled project)

The following table compares the size, impact and costs effectiveness of activities of investment projects in various sectors.

Type of Enterprises	**Number**	**ODP Impact**	**Cost effectiveness**
Enterprises larger than 50 ODP T	22	3,679.7	6.60

Enterprises smaller than 50 bigger than 10 ODP T	70	1,451.6	11.75
Enterprises smaller than 10 ODP T	15	126.0	13.73
Rigid foam	9	1,396.0	6.50
Flexible foam	10	933.0	5.10
Integral foam	6	185.0	11.10
Domestic/commercial Ref. Man.	9	119.0	12.60
Domestic Ref. Man.	38	1,596.0	11.60
Commercial Ref. Man.	45	1,108.0	11.90

Table 1.9 Sizes, impact and costs of activities of investment projects

The majority of remaining enterprises without approved projects are comparatively small in size and large in number compared to the individual projects before. They are more difficult to identify and access in the large country. While MLF assistance has been critical to Iran's efforts to reduce CFC consumption, these smaller enterprises consume significant amounts of CFC in total and it is essential to extent the MLF assistance to Iran in order to phase out all remaining consumption.

The elimination of the remaining consumption needs an approach different from the previously applied. More flexibility is needed to react to the varying demands of smaller enterprises and their extended need for technical assistance and training. The national-substance wide phase-out approach will be best suited to provide larger flexibility in the utilization of the remaining funds in order to achieve maximum impact of available resources.

However, as table 1.9 indicates the height of cost effectiveness more than doubles in case of enterprises that consume less than 10 ODP Tons, compared to those with a consumption of more than 50 ODP tons. This has to be kept in mind while evaluating the challenge of converting the remaining enterprises in the country.

From experience in other similar developing countries, the group approach has been proven to be effective in terms of coverage, cost-effectiveness and CFC phase-out, though it has not necessarily been fully effective in mitigating the infrastructure barriers, such as technology awareness, technical assistance, training, etc. It is mainly due to the relatively limited amounts of resources approved for individually approved group projects, which are considered to be crucial in sustaining the viability of the enterprises and the CFC phase-out. The national Phase out Plan is better suited to address the essential requirements for a cost-effective and sustainable phase-out under consideration of the potential socioeconomic impacts.

2 CFC CONSUMPTION AND DISTRIBUTION BY SECTOR

2.1 SOURCES OF CFC SUPPLY

Refrigerants and the blowing agents are not manufactured in Iran and the domestic requirements are met through imports from various producers. Different CFC refrigerants are mainly imported in three modes:

- Importing through different customs houses,
- Importing through special economic zones and/or industrial/commercial free zones and border markets,
- Non-registered importation through different seashore and land market borders.

Iran has 15 ports and harbours. According to the I.R. Customs information there are more than 80 customs point located in land, air and see borders. There are national codes under which CFC is imported and registered. The material will be then traced and controlled by the government.

Related information such as weight and value of the material are recorded during issuance of relevant licenses for official importing and bank formalities for opening L/Cs. However, it should be noted here, that Iran has not received any assistance in Customs officer training. Therefore, detailed information on type of CFC and final destination cannot easily be traced from the declarations.

In order to obtain consumption throughout the sector it is important to verify the figures in accordance with the information from large importers, chemical manufacturers, refrigeration manufacturers, Ministry of commerce etc.

Various known traders, union of refrigeration service shops association and large domestics/commercial appliances manufacturers import majority of different types of ODSs such as refrigerant CFCs. CFC is almost exclusively bought at local markets, a list of registered local suppliers and retailers can be found in the Annex XII. The retailers are acquiring their supply from major suppliers, but it is suspected that they are supplied also by a number of unknown sources, which they generally do not like to disclose. These are direct imports through duty free ports and zones and/or some of the remote border stations to the neighbouring countries, where it is almost impossible to control character and origin of a chemical. Most of the CFCs origin from China and India, but imports from Greece, Italy and other European countries can be found as well.

List of major CFC importers
Rohaam Gas
Kalege
Alish Gaz
Pars Chemical
Danaayan
Peyman Touse
Sarmayeh Gozaari
Sarchemeh Cupper
Mehr Asl
Houragen
Iran Arsemaan
Sahand Tabaan Mehr
Derakshshesh Paymaan Omnid
Pouder Sazaan
Zharfaayeh Ofogh
Gordaans International
Amid Sepahaan

Table 2.1 Major CFC importers

2.2 Remaining CFC consumption in the country

Based on the recent EXCOM Decision 35/57, further MLF funding is predicated on a commitment by Iran to achieve sustainable permanent aggregate reductions in CFC consumption and production. Having selected Option 2 of Decision 35/57 for determining the starting point for implementation of it's national aggregate consumption (Reported 2000 CFC consumption data minus projects approved but not yet implemented as of December 2000, detailed list in the Annex XIV), according to the latest available Phase-out Plan issued by the Multilateral Fund Secretariat at the 38th meeting the total remaining fundable consumption of Iran is 1,708.4 ODP T (see Annex XIV).

Country	**2000 consumption**	**CFC consumption of ongoing approved projects**	**Remaining fundable consumption at the 38th**

		at the 38th meeting	**meeting**
Iran	4,156.5	2,448.1*	1,708.4

* The 2,448.1 tons include 2 projects (48.5 ODP tons) that have been cancelled in 2001 and 2002 (Bahanfarr, Nobough). The question whether or not these projects need to be included as additional fundable consumption remains to be an issue of discussion between the secretariat and the country, which has not been resolved during the time of proposal development)

Table 2.2 Total remaining fundable CFC-consumption

YEAR	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Reported consumption	5,883	5,571	4,399	4,157	4,221	n.a.	n.a.
Accum. annual CFC phase out from completed projects*	--	757	2,329	2,617	2,785	2,901	n.a.
Real growth of CFC based on reported cons. plus accumulated phase out	5,883	6,328	6,728	6,774	7,007	7,376	n.a.
Projected growth of 6,5 % (GDP) as in the CP	5,883	6,265	6,673	7,106	7,568	8,060	8,584
Adjusted Projection at 4,07 % real growth (GDP) since 1997	5,883	6,122	6,372	6,631	6,901	7,182	7,474

* It is assumed here, that reductions become only effective in the following year of reported completion.

Table 2.3 Recent development of demand and original projections based on chapter 2

The remaining eligible consumption is largely congruous with the revised projection of CFC consumption and a crosscheck of actual remaining consumption with the demand scenario developed in chapter can be applied for confirmation:

Item	**ODP T**
Demand scenario based on reported consumption and accumulated CFC phased out	7,376
Total of approved projects	5,234
Balance	**2,142**

Table 2.4 Balance between accumulated CFC demand and the total of approved projects

The estimated balance of the remaining consumption based on reporting and projection is somewhat higher than the remaining calculated consumption according to 35/57 and indicates that the fundable 1,708 ODP T represent rather a minimum, then the maximum.

It has also to be noted that the new codification system in customs has only come into effect in 2002, which allows for the first time a comprehensive and complete registration of all imports. Earlier import figures may have been underreported, because some of the CFCs might have been wrongly identified as non-CFC under the old existing code.

2.3 The Future CFC Demand Scenario

Based on the baseline consumption (average consumption 95-97) the compliance targets in 2005 and 2007 have been set as follows:

Country	**Baseline consumption**	**50%Base in 2005**	**85%Base in 2007**	**Phase Out required for 50%**	**Phase Out required for 85%**
Iran	4,571.7	2,285.9	685.8	484.6*	1,022.6

*not including the implementation delays of already approved projects.

Table 2.5 Compliance targets

The average baseline consumption for Iran was calculated at 4,571 ODP T for the average of the years 1995 to 1997. With the consumption of 4,221 ODP tons of Annex A CFCs in 2001 (including 50 ODP tons of MDI), as illustrated in Graph 1, the Islamic Republic of Iran is in compliance with the Montreal Protocol "Freeze" control level of 4,571 ODP tons. Furthermore, taking the ongoing, approved projects into account it is already some 70 ODP tons below the compliance level of 2,286 ODP tons of CFC consumption that it must meet in 2005. However, taking into account the completion dates of approved projects and the delays of some of the projects, Iran cannot meet its compliance in 2005 without further assistance.

The following graph illustrates the trend of consumption in ODP tons of Annex A Group I CFCs in Iran and the consumption control levels for compliance with the Montreal Protocol.

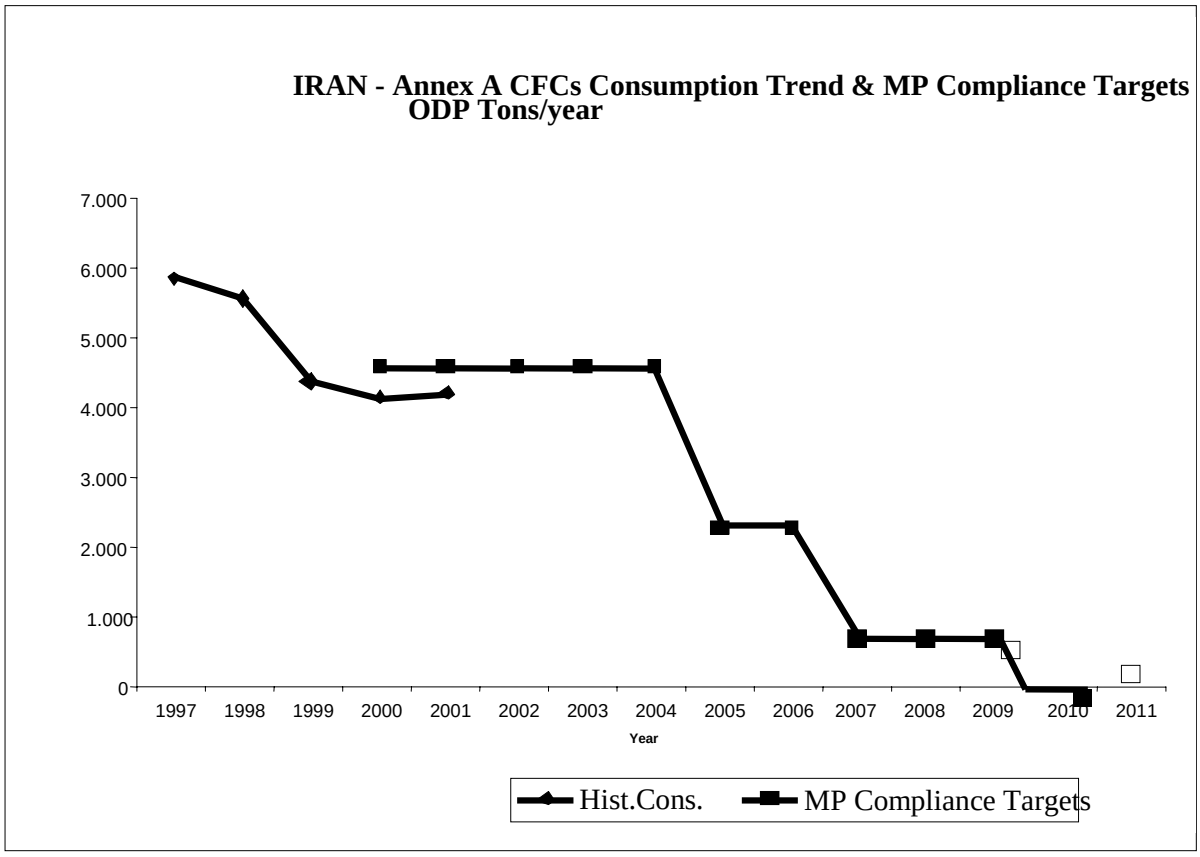


Figure 2.1 Actual CFC Consumption and MP Compliance Levels

As can be seen in Figure 2.1, there has been a steady decline of consumption between 1997 and 2000, with a rather insignificant incline for 2001, which appears because MDI's have wrongly be included in the reporting of obligated CFC consumption. It should be also noted here, that in 2001 no additional approved projects have been completed, which could have reduced the consumption versus 2000.

The total demand for CFCs is expected to decline during the period 2004 – 2007 as a result of the completion of ongoing MLF investment projects to eliminate CFC consumption in both the foam and refrigeration manufacturing sectors. Based on the projects approved as of 25 November 2002, the ongoing projects should eliminate a total of 2,448.1 ODP tons of CFCs according to the schedule as indicated in the following table.

Annex A CFC Consumption and phase-out dates by Ongoing Projects (ODP tons)							
2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Total**
151	116	0	1,120	988	73	0	**2,448.1**

Table 2.6 Actual elimination of CFCs from presently ongoing projects, based on approved projects as of 25 November 2002

With no other changes (including no further increase of ODP consumption), the total consumption of CFCs is then expected to decline to 1,708.4 ODP tons in 2007 only, when the full impact of the completion of all current ongoing projects is realised. This suggests that the I.R. of Iran will not be in compliance 2005 and 2007 without further assistance.

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Compliance targets in ODP tonnes	4,571.0	4,571.0	4,571.0	4,571.0	2,286.0	2,286.0	685.0	685.0	685.0	0
Reductions from Ongoing Projects	4,156.5	4,005.4	3,889.4	3,889.4	2,769.4	1,781.4	1,708.4	1,708.4	1,708.4	1,708.4

Table 2.7 Reductions from ongoing projects in ODP T, their accumulation and projection

It must also be noted that the projected annual reductions in CFC consumption from the completion of ongoing projects are based on the actual completion dates. This may however change, experience shows that projects are often delayed, e.g. when the required counterpart funding from the recipient company necessary to complete the project may not be available.

All projections of demand for CFCs then lead to the same conclusion that with no additional intervention by the Government or the Multilateral Fund, Iran will not meet its Montreal Protocol compliance target for CFC consumption in 2005 and 2007. Assuming a best-case scenario that demand in the service sector remains constant at the same level as in 2000, and all ongoing investment projects in the manufacturing sector are completed as scheduled the projected consumption over the period 2001 – 2010 would be as in the following graph.

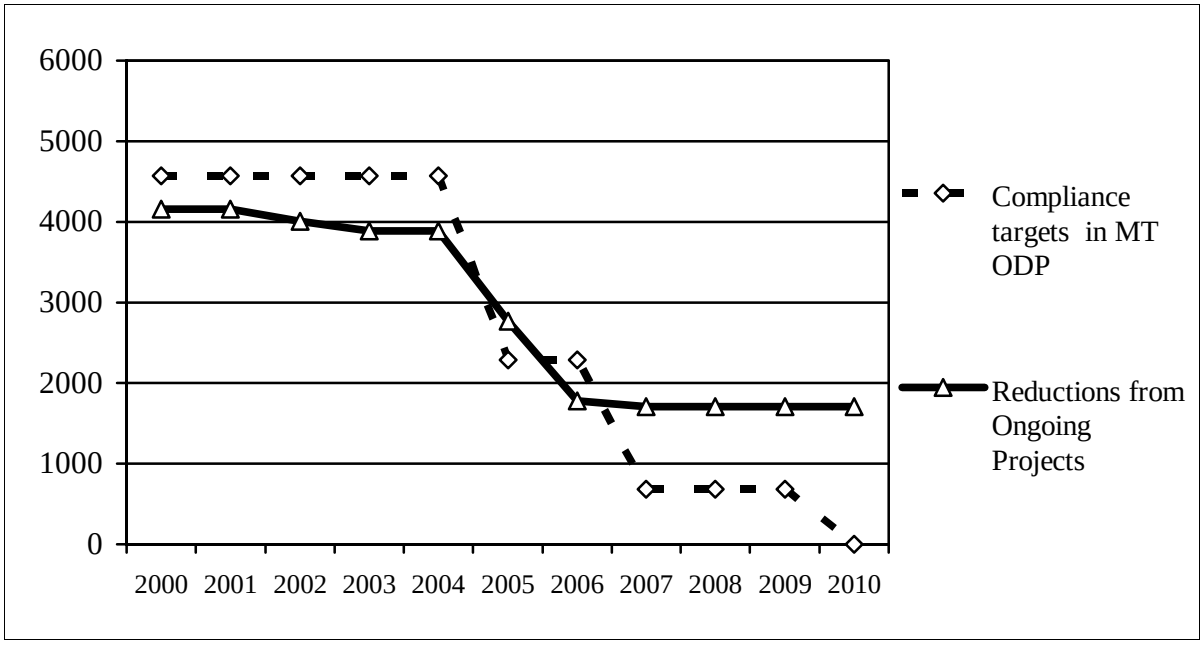


Figure 2.2 CFC Phase Out scenario with ongoing projects

It should be noted that while the table contains the amounts of CFC that are scheduled to be phased-out in each of the years 2001 – 2010, the full impact of the reduction will not be felt until the

following year. The table has therefore been constructed to illustrate this, as it is considered a more realistic forecast of future consumption.

2.4 Sector Breakdown of CFC consumption

2.4.1 Frame conditions of data assessment

During the first times of reporting, Iran just emerged from a period of war. Statistics in general, and statistics on chemical imports in specific, were a sensitive issue. Therefore Iran has been among the countries, where the determination of CFC out of the existing import statistics has been a complex and elaborate task. Nevertheless, in the course of time Iran has constantly tried to improve reporting.

The continued sophistication of reporting practice resulted in the variation of reported sub sector consumption. Therefore, the ExCom recommended to finally lay down and explain the sector consumption in a National Plan document. With the implementation of the National Plan and its sub sector surveys, a more accurate and holistic picture of the sector breakdown and remaining consumption in the sectors in Iran can now be delivered.

In the following general problems and conditions that the NOU were facing in their reporting are concluded:

- Iran had no country program update so far.
- There has been no customs training yet.
- Existing customs declarations did not classify between CFC12 and CFC11; CFC imports were under the same codes (used for chlorinated chemicals). If not clearly identifiable, CFCs had been omitted from the list.
- Some of the CFC blended chemicals were imported under codes of other chemicals.
- The CFC is sold through a very large number of smaller local chemical suppliers, who do not know the exact use of the CFC of the end user (besides they are often reluctant to provide such information).
- Production companies, who keep only part of the import and sell the rest to others companies, also import some of the CFC.
- The regional know how among stakeholders/sector experts is generally limited and there is a predominant focus on Tehran.
- It is financially and logistically impossible for the Ozone Office to cover the whole country.
- Service sector activities and the consumption of small and micro-enterprises remained to be a largely unknown until the sector surveys were conducted.
- Many enterprises are still reluctant to disclose production figures to a government institution.
- The total enterprise consumption exceeded import figures. The reasons were not always clear. It is difficult to establish whether the excess consumption results from incorrect declaration, from stockpiles or other unknown sources.
- Without physical proof of enterprise information, misunderstandings and wrong perceptions of enterprises in their reporting cannot be verified.

2.4.2 History of data reporting

In order to comply with Excoms recommendations, a more detailed explanation is provided on possible causes of inaccuracies in reported consumption figures.

CFCs in general had been imported under chlorine based chemicals tariff along with other chemicals that contained chlorine till 2001. The determination of the total CFC import figures from the import statistics was continuously adapted to the demands of the MF.

The first import data for the years 1991/1992 were derived during the preparation of the country program. There was no specific coding of CFCs during this time. The customs list which referred to

the import of chlorinated chemicals in general provided only names of importers and quantities. In order to derive the total amount of imports, known importers of CFC were contacted and the amounts of CFC imports were verified.

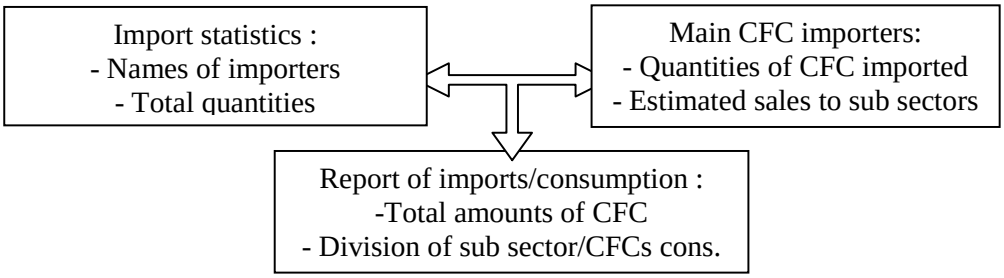


Figure 2.3 Original Import reporting

The underlying assumption:
The quantities reported by the importers are analogous to the total import.

In practice this system had some weaknesses:

- The list of importers was automatically transferred from year to year, leaving out some of the newly established importers
- Smaller imports from private companies were likely not to be discovered.
- As it has been the case with many other countries, the given imports were identical with the consumption (originating from the same source)

Given above facts, the total import and consumption represented rather the lower, then the upper consumption and the amount of legally imported CFC was in fact slightly higher than reported. With growing experience, the limitations of this system were realized. In 1997 an internal review established a more effective system for reporting.

The new system tried to overcome the weaknesses of sub sector consumption through the inclusion of a third indicator for verification, the private sector consumers. The originally only fragmentary available list of main enterprises in the sector were further compiled and used for the monitoring of enterprise consumption.

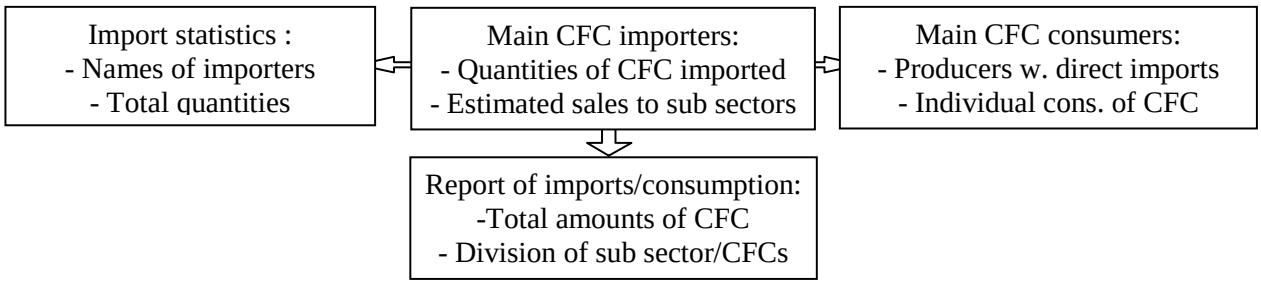


Figure 2.4 Consumer verified reporting system

Important underlying assumptions:
The bottom up inventory of enterprises and their reported consumption provides a more realistic proportional distribution of type and use of CFC in the sub sectors. The total amounts are verified against the total amounts given by the importers and in the import statistics.

This new system improved the precision of sub sector consumption largely and also allowed the identification of new and smaller importers of CFCs, that had previously not been identified. Nevertheless this system still maintained some problems:

- No comprehensive inventory was in place until the end of 1999, when two surveys were conducted by the implementing agencies to identify the remaining CFC consuming units in

the refrigeration sector. In the other sectors due to the lack of comprehensive inventories only the consumption of known large consumers were collected to calculate the proportional consumption between the sectors.

- Only large sector surveys as applied prior to the preparation of the National Plan provided the necessary census in order to detect a reliable size of consumers for just distribution of subsector consumption.
- The consumption of smaller manufacturers and servicing enterprises, which were originally not detected, were largely underreported.
- It was impossible to verify the origin of CFC in each individual enterprise, therefore the consumption figures were only used to determine the proportional distribution for the subsectors of the legally registered and verified imports.
- As a consequence the reported consumption of the sub sectors had to be adjusted several times with the availability of better, actual data.

Other principal problems had to be overcome by the NOU. The reporting quality could have only improved with adjustment to the new coding system. In order to do this, the ministry of finance required resources and capacities for training and upgrade of their system that were not available for the time being. Moreover, lack of cooperation, low problem awareness and communication problems of some key stakeholders in ministries and private sector made it time consuming to bring CFC phase out to the top of the agenda.

Several preconditions had to be met before the new „harmonized system“ according to that CFC11 and CFC12 are being imported under their separately designated tariff could be introduced in March 2001. Since March 2002 every single CFC has been imported under its own designated tariff.

2.4.3 Approach followed in the National Phase Out Plan

Because of the circumstances described above and the difficulties the country is facing as a result of geographical dispersion, market situation and its status of reconstruction after the long war with Iraq, the data gathered had to be revised several times. Especially with view on the smaller enterprises, it is virtually impossible to assess each and every company.

During the establishment of the National Plan all available data was reviewed. Other causes for misunderstanding had been discovered. For example, in the refrigeration manufacturing sector survey all companies doing assembly were included as manufacturers, while the NOU excluded assemblers from their list of manufacturers. Therefore they had been excluded from the latest communication with the secretariat in June 2001.

2.4.4 Limitations of the National Phase Out Plan

The national Phase Out Plan describes the origin of such discrepancies as much as possible, nevertheless it has to be acknowledged that there are certain limits of detail. For example, eligibility of enterprises and consumption can only be established at enterprise level. The verification CFC origin at the level of local CFC suppliers is impossible.

In order to avoid inaccuracies in the statement of eligible consumption further on, the NPP refers to the total surveyed eligible consumption only, independent of the origin of the supplies. With the acceptance of this plan, the I.R. Iran will commit to phase out all remaining CFC consumption in the named sectors, including consumption that exceeds the fundable consumption.

2.4.5 Consistency of fundable consumption figure

Because of the history described above, a dialogue has been going on between the MLF secretariat, the I.R. of Iran, UNDP, and UNIDO in the past two year over two issues:

a. Unaddressed remaining consumption of CFCs in refrigeration manufacturing, and

b. How much of the consumption is eligible for MLF funding. The genesis of this discussion dates back to 2000 at the 32nd Meeting of the ExCom, when 14 domestic and commercial refrigeration projects were submitted for approval. The Secretariat raised some issues regarding accuracy of data on ODS consumption in the refrigeration sector, the list of the remaining enterprises, and evidence of government commitment to ODP phase-out. Based on Decision 32/65 the projects were deferred to the 34th Meeting of the ExCom. During the 34th Meeting the Secretariat reported that the consumption data issue reflected in Decision 32/65 had been resolved, and reliable consumption data for refrigeration sector were established.
c. The inclusion of 2 cancelled projects into the calculation of fundable consumption (should not be discounted as ongoing consumption from the remaining fundable consumption).

According to the UNEP/OzL.Pro/ExCom/38/37, CFC consumption in 1999 in refrigeration sector, which was 1,920 ODP tons, including manufacturing and servicing was used as the basis for calculating the remaining fundable consumption in 2000 and 446.89 ODP tons for servicing and SMEs. Later on, the in-depth study for the elaboration of the final sector phase out strategy revealed further enterprises, which had been overseen for reasons described earlier.

Similar studies in the foam sector revealed similar results and showed a deviation from the total accumulated sector consumption by 12 %. However, this deviation has to be seen in the light, that the previous estimates did not really monitor increasing production of eligible companies and existence of small and micro enterprises. Another reason is that between 1992 and 1995 many new companies had been founded as a result of the post war restructuring of the industrial sector. The estimates of the original CP did not include these enterprises.

The graph below shows the already approved, the differences of historical accumulation with the reported and surveyed consumption figures and the equivalent of the funding requests in each sector.

	Ref. Manuf.	Ref. Assmbl.	MAC	D&CService	Foam	CFC Solvent
Total Sector approved	**2704**	**0**	**0**	**0**	**2513**	**0**
Total reported Nairobi	**3371**	**0**	**326**	**475**	**2720**	**62**
Total surveyed	**3198**	**137**	**350**	**750**	**3179**	**65**
Funding equivalent	**2885**	**85**	**326**	**475**	**3089**	**65**

Figure 2.5 Comparison of total approved consumption with accumulation of either reported, surveyed or equivalent of funding request.

For the NPP, the government of Iran has placed its funding requests very much in line with earlier reporting and documentation. However, in cases like the foam sector, where there has been no comprehensive inventory and sector survey before, it is understandable that changes are likely to occur in the given range and dimension. There, the findings of the sector survey provide the only realistic basis for the establishment of remaining fundable consumption.

In meeting the financial needs, the minimum required costs in the sector have been applied for calculation. Eligible fundable consumption is based on 2000 reporting and is not adjusted for the additional annual growth of CFC consumption in later years, which in fact has occurred and remains to grow until the eligible, but yet not approved or implemented projects are effectively converted.

The I.R. of Iran would cover these and all other accruing additional costs that are necessary to phase out all excess CFC consumption in the named sectors, without requesting any further assistance from the MLF.

2.4.6 Breakdown of actual CFC consumption based on reporting and sector surveys

Based on the reporting for 2000 the following breakdown has been delivered for the various CFCs. The overall CFC consumption for all sectors in Iran, as reported by the Government of Iran for the various CFC consuming sectors, is as tabulated below:

The division of CFC Consumption between all CFC consuming sectors based on earlier reporting:

Sector	Baseline Consumption 95/97	Reported Consumption 2000	Consumption from ongoing projects (38th Meeting)	Calculated fundable consumption on 35/57 (2000 baseline)
Aerosols/MDI				
Refrigeration Manufacturing	1,621.0	1,826.6	1,134.8	691.8
Refrigeration Assembly				
Refrigeration Servicing				
RMP	450.0	450.0		450.0
MAC	357.0	350.0		350.0
Foams	2,132.0	1,520.0	1,313.4	206.6
Solvents	11.0	10.0		10.0
Total	**4,571.0**	**4,156.6**	**2,448.1**	**1,708.4**

Table 2.8 Historical CFC Recording of all sectors

Based on the surveys in the various sectors, the division of CFC sector consumption was revised and the eligible consumption was reallocated accordingly.

It has to be noted that in all sectors excess consumption was identified, which exceeds the limits of remaining fundable consumption as per Decision 35/57 Proviso B. Eligibility here purely applies to the enterprises which have sufficiently verified that their production meets the incremental cost criteria according to the MLF guidelines.

Sector	Calculated remaining fundable consumption	All reported/ estimated consumption from sector surveys	Consumption* of verified eligible uses/sources only
Aerosols/MDI		(93) not included	(93) not included
Refrigeration Manufacturing	691.8	494.0	382.7
Refrigeration Assembly		137.0	105.5
Refrigeration Servicing			
Domestic and Commercial Units (RMP)	450.0	750.0	475.0

Mobile units (MAC)	350.0	575.0	350.0
Foams	206.6	675.8	628.4
Solvents	10.0	64.8	64.8
Total	**1,708.4****	**2,634.5**	**2,016.4**

Table 2.9 Remaining consumption surveyed

* Consumption includes only enterprises that have delivered proof of eligibility. However, enterprises who have not responded in time may still be eligible.
** excluding two cancelled projects see Annex XIV.

There was no local production of CFCs in the Islamic Republic of Iran in 2001. Because Iran will commit to phase out all remaining CFC consumption in the country, excessive consumption will be dealt with through legislative and regulative measures and through the technical assistance components in the sector. The reallocation of fundable consumption was done under consideration of the minimum funding that is needed to address and phase out the eligible consumption in a sector.

A more detailed, individual breakdown of consumption in each sector will be illustrated in chapter 4.

CFC	**Sector Consumption**	**ODP Tons by Sector**	**ODP Tons Total**
CFC 11	Import		2,596
	Consumption		2,596
	Aerosols(MDI)	33	
	Foam	1,515	
	Refrigeration (Manufacturing)	1,047	
	Refrigeration (Servicing)		
CFC 12	Import		1,538
	Consumption		1,538
	Aerosols	17	
	Refrigeration (Manufacturing)	720	
	Domestic/commercial (Servicing)	475	
	MAC (Servicing)	326	
CFC 113	Import		62
	Consumption		62
	Solvent	62	
CFC 114	Import as R 502		15
	Consumption		15
	Refrigeration (Manufacturing)	15	
CFC 115	Import		10
	Consumption		10
	Refrigeration (Manufacturing)	10	
Total CFC Imports			**4,221**
Total CFC Exports			**0**
Total CFC Consumption			**4,221**

Table 2.10 Reported CFC Consumption by Sector (ODP tons) – 2001

Most of the CFC is imported through the ports, but there is also a large quantity that enters the borders through Pakistan and the bordering Central Asian countries, where mainly Indian and Chinese CFC supplies enter.

With the ongoing completion of investment projects to eliminate CFC consumption at the larger, more easily identifiable enterprises in the manufacturing sector, the remaining CFC consumption is now by

micro, small and medium sized enterprises. While they are believed to exist in significant numbers, they are not easily identifiable. While considerable effort has been put into identifying such enterprises in the foam and commercial refrigeration sectors, it is accepted by everybody that it is impossible to identify every single SME that is consuming CFCs.

3 EXISTING POLICIES AND REGULATIONS

3.1 Institutional Framework

Country Program
In 1993 the first draft of the Country Program for the implementation of the Montreal Programs was finalized and submitted for approval. It was approved at the 10th meeting of the Executive Committee in June 1993. An internal revision of the County Program(CP) was made in 1995. The second CP update was approved by the 36th meeting of the Ex.Com in 2002 and is under preparation.
The country program aimed to identify ways to manage the undue economic burden for both consumers and industry, to minimize economic dislocation as a result of ODS phase-out, minimize industrial obsolescence, maximize indigenous production, promote a one-step phase-out and to emphasize decentralized management.

Institutional Strengthening
In 1993 the first project document for the Institutional strengthening of the Ozone Layer Protection Unit (OLPU) was approved in the 10th Ex.Com. meeting to be implemented by UNDP and DOE. In 1994 the OLPU started functioning as the National Focal Point with the objective, to build and strengthen the national capabilities and capacities of the government as well as the enterprises and other involved non-governmental organizations to facilitate effective and smooth implementation of the Montreal Protocol programs.

National Ozone Committee (NOC)
In 1994 the first meeting of the National Ozone Committee (NOC) was held with the attendance of representatives of Department of Human Environment and the Ministry of Industry. The NOC coordinate proper decision-making and develop policies for effective implementation of the Montreal Protocol in the country as the highest authoritative body. The NOC is chaired by the National Project Director and the Deputy Head of the DOE for Human Environment Affairs.
Other members of the NOC are representatives from Ministries of Foreign Affairs, Industry & Mine, Agriculture, Oil, Commerce, Management and Planning Organization, Custom Administration, Meteorological Organization and other ministries and organizations as required.

National Ozone Unit
The secretariat of the NOC is the National Ozone Unit (originally called Ozone Layer Protection Unit) with the following tasks and responsibilities:

- Secretariat for the National Ozone Committee
- Co-ordinate and facilitate implementation of the phase out projects and activities in accordance with the National and international policies and regulations
- Monitor the national ODS phase out activities and its compliance with the national and MP decisions and policies
- Collect & process reliable data on the ODS consumption/import and annually report to the Ozone and MLF Secretariats
- Focal point and liaison to facilitate and co-ordinate communications among the implementing agencies, enterprises and other involved national governmental organizations
- Participate in the national, regional and international meetings
- Facilitate preparation, updating & implementation of the Country Program
- Prepare annual report on the progress of implementation of the country program
- Persuade enterprises to co-operate with the government to meet the objectives elaborated in the CP
- Follow up public awareness campaigns

Since 1994 the Ozone Office has prepared and facilitated the implementation of 108 investment phase-out projects, several demonstration projects on different ODS phase out and training project. Investment projects implemented by implementing agencies are listed below:

Agency	No of CFC Investment projects
UNDP	46
UNIDO	54
Germany	7
France	1

Table 3.1 Project shares of various Agencies

3.2 Regulatory and legislative Action:

Regulatory measures

The ozone office has instituted and elaborate legal procedure for review and endorsement of project proposals, for submission to the Multilateral Fund for funding. Each enterprise seeking assistance is required to make a formal application to the DOE in prescribed formats along with legally binding documentation and certifications for establishing its eligibility, CFC consumption and financial viability.

I.R. of Iran has continuously sought to develop and issue policies, regulations, and bans that regulate the use of ODS. So far, I.R. of Iran has taken the following major actions:

- Conducted training programs, public awareness campaign, and media promotions to publicize the Ozone issue, and information dissemination on the use of Ozone-friendly technologies every year;
- Banned import of CFC-based hermetic compressors in 2002;
- Banned establishment of new enterprises using ODS;
- Banned expansion of existing enterprises using ODS;
- Prohibited enterprises that have converted to non-ODS technology to revert to ODS;
- Banned trade of ODSs with countries that are not party to MP;
- Identified ODS importers for issuance of import licensing system;
- Reduced excise tax on non-ODS compressors in 2002;
- Import of ODSs given in Annex A & B under MP guidelines became subject to quota from 2003;
- Codified all ODSs;
- Constituted the “Law & Regulation Sub-committee” to develop plans for establishment, and enforcement of “Licensing System”;
- Exempted capital goods for projects funded by MLF from Customs & Excise Tariffs in 1966;
- Exempted enterprises converted to non-ODS technology from sales tax from 2002, and reduced commercial benefit tax on import of non-ODS compressor; and
- Drafted Comprehensive Plan on ODS Phase-out Regulations/Policies, as well as the “Import and Export Licensing System” in June 2003.

Enforcement of the Import and Export Licensing System will bring the I.R. of Iran in compliance with licensing system requirements, i.e. the amendment to the MP agreed by the 9th Meeting of the Parties (Sep. 15-17, 1997) on Article 4B: Licensing. The setting up of «Licensing System», which had taken a while to initiate is now being processed through issuance of « Comprehensive Plan on ODS Phase-out Regulations/Policies», which includes Licensing System as one of its annexes.

Legislation:

- Ban on new capacity or expansion of capacity for production of ODS based equipment.
- Mandatory registration with designated authorities
- Declaration requirement for the supplier, at the time of procurement of ODS

- Mandatory registration for Exporters & Importers with designated authorities
- Every person who uses, imports, sells, stocks, reclaims or destroys ODS has to maintain records and file reports as specified.
- Full exemption from payment of Customs and Excise tariffs on capital goods required to implement ODS phase out projects funded by the Multilateral Fund.
- Every entity, which has received technical and/or financial assistance from any international agency or financial assistance from the government of Iran including duty exemptions, is required to maintain records and file reports as specified.

3.3 Policy Framework

The government of Iran has consecutively and stringently implemented regulation and bans, that regulate the restricted use and final elimination of CFCs in the country. The following list illustrates the steps that have been taken by the government so far:

- Ratification/acceptance of Vienna Convention and Montreal protocol in 1990,
- Ratification / acceptance of London, Copenhagen Amendment in 1997,
- Ratification/acceptance of Montreal Amendment 1997,
- Ban on import of hermetic compressors (1/3 to 1/8 horse power),
- Ban establishment of new ODS using units (update is required) ,
- Ban of ODS consumption by units converted to non-ODS technology,
- Economic incentives (e.g. exempt enterprises that convert to non-ODS technology from import duties and tax, decrease commercial benefit tax on import of non-ODS compressor)
- Codification of all ODSs,
- Establishment of the “Licensing System” (ODS import/ export registration form has been prepared, quota system proposed to the Ministry of Commerce).

Following the ratification of VC, MP and its amendments, no further laws need to be passed. Rather, based on existing laws, further rules and regulations are introduced by directive of the concerned ministry.

As an example, there is no further need to pass a law on the establishment of a Licensing System. Instead it is decided that a total maximum import of CFC is allowed for each year and depending on the rate of conversion of enterprises, the ceiling is reduced year by year and finally total import will be banned by 2010.

3.4 Public Awareness Programs

The NOU has facilitated promotion of the ODS Phase-out Program in the I.R. of Iran by conducting a large number of seminars, and training programs throughout the county on a wide variety of topics. It also has organized publicity programs on television; and distributed training materials/brochures to raise public awareness on the ozone issues. On an annual basis the NOU has:

- Actively participated in the Iran International Environment Exhibition;
- Commemorated the International Ozone Day (September 16);
- Published the “Ozone Year Book” containing training materials on the protection of the Ozone Layer;
- Organized caricature, painting, poster contests for children and youth;
- Conducted TV interviews, video clips, and TV reports; and
- Published and distributed publicity materials for most of the past ten years.

In 1997 NOU printed a stamp in commemoration of the 10th anniversary of the MP, which was well received by the public. The I.R. of Iran participates regularly in the Regional UNEP Network and Technical Meetings.

3.5 Government Action Plans and Country Programs

Policy implementation was based on the sectoral analysis of ODS users in the first Country Program, and proposals for related economic, technological and regulatory actions, with the latter two receiving most attention.

The Plan of Action presented in the 1993 Country Program included proposals for establishing policies that would define quota reductions on production and consumption of ODS for all domestic manufacturers. Moreover, it included strategies of gradual limitation or prohibition of ODS imports, as well as proposals for federal/state tax increases on ODS. Other more specific actions included:

- Prohibiting of production, import, export and commercialisation in the domestic market of new products containing ODS;
- Labelling (seal) for substances that do not harm the ozone layer;
- Supplemental regulatory procedures for ODS production and import;
- Specific awareness programs for small industries and services companies;
- Regulation to limit voluntary emissions and escapes during servicing or operation of equipment with ODS;
- Workshops and public information campaigns for sector stakeholders

Establishing legislation and standards with the following objectives:

- To define annual quota of ODS production, in reference to its own production level established by the average of 1995/1996/1997 figures, aiming at meeting the deadlines provided by the Montreal Protocol;
- To define annual decrease of ODS imports, through quotas;
- To establish quality standards for alternative substances, recycled gases and converted equipment, as practiced by Article 2 countries;
- To prohibit voluntary emissions during the operation or servicing of equipment that contains ODS, except for essential use;
- To ensure the quality of recycled gases.
- Set up Control and Inspection Systems with the following objectives:
- To establish regulatory actions that allow a period for phase-out of ODS import;
- To prohibit the manufacture, import, export and domestic commercialisation of new end products which contain ODS, except for repair parts and components to be used in existing systems and equipment. The dates chosen will be in agreement with the completion of the sectoral phase-outs;
- To avoid the return to ODS in systems that are already ODS-free;
- Creation of economic instruments with the following objectives:
- To define increasing rates for federal and state taxes applied to ODS;
- To define investments or financing that encourage the use of ODS replacements and discourage the use of ODS, by the various industrial sectors;
- To exempt the Multilateral Fund supplies from taxes and tariffs;
- To encourage the adoption of alternative technologies by consumers;
- Establish Training Programs with the following objectives:
- To train refrigeration technicians, and issue certification to those engaged in installation and repair of refrigeration equipment, as well as to those involved in recovering and recycling programs.
- Establishment of a public campaign with the following objectives:
- To establish a public awareness campaign on the importance of the ozone layer issue and its effects on habitat, particularly on human life, and illustrate the current, National and International, Government and industry actions to address the problem, as well as reporting on the overall contribution of the country to the Montreal Protocol;

- To label substances that are not harmful to the ozone layer. This should be combined with a public awareness program to ensure favouring of ODS-free technologies;
- To reach out to small and medium size industries and service companies, that will allow such a labelling program to be positively adopted.

4 SECTOR BASELINE INFORMATION

4.1 Refrigeration sector

4.1.1 Refrigeration sector - general background

The Refrigeration Sector in Iran accounts for about 45% of Iran's baseline CFC consumption in 2000. Since 1993, until December 2002, a total of 83 investment projects in the Refrigeration (Manufacturing) Sector have been funded under the Montreal Protocol mechanism**,** implemented by UNDP or UNIDO. The detailed list of investment projects approved in this sector till end-2001 is attached in Annex II.

The refrigeration sector in Iran has experienced significant growth in the past decade due to the consistent growth in the per capita incomes, the predominance of the service industry and the relatively low market penetration of refrigeration appliances and equipment during war and the early 90s post war period. CFCs are consumed as blowing agents (CFC-11) and refrigerants (CFC-11, CFC-12, R-502, R-22, etc) in the manufacture of refrigeration and air-conditioning products.

Aging equipment, coupled with a large number of service mechanics (estimated as circa 25,000) rendering low quality service because they lack training and appropriate tools, is then a recipe for increased consumption of CFC 12 in the refrigeration and air-conditioning service sectors. The fundable CFC consumption in the refrigeration and air-conditioning service sectors in 2001 was 475 ODP tons, almost all CFC 12.

Sub-Sector	Number of approved projects	CFC- Phase-out Target (ODP T)	Approved funding (US $)	Overall CE (US $/kg)
Domestic and commercial refrigeration	83	2,704*	29,357,920	10.9
Service sector	--	--	--	--

*Excludes consumption and funding from cancelled project IRA/REF/31/INV/070 Bahranfarr.

Table 4.1 Iran Refrigeration Sector - Historical investment project approvals as of December 2002

The Montreal Protocol program in Iran has addressed predominantly the domestic and commercial refrigeration sub-sectors, considering the significant contribution of the sector to the overall CFC consumption in Iran as well as considering the significant socio-economic impact of the sector due its capacity to generate employment and incomes.

Remaining consumption in the Refrigeration sector is only by micro, small and medium-sized enterprises characterized by modest levels of investments, training, technical knowledge base and awareness available to these enterprises. Moreover, the enterprises are scattered and difficult to access.

The large enterprises in the domestic refrigeration sub-sector selected cyclo-pentane technology for conversion of their foam operations. Most medium and small-sized enterprises selected HCFC-141b based systems. Primarily the scale of operations and costs has guided the choices. For the refrigerant operations, enterprises of all approved projects in the sector have chosen HFC-based technology.

The following is the current CFC phase-out status in the Refrigeration Sector:

Refrigeration Sub Sector	**Status**
Refrigeration Manufacturing	
Domestic refrigeration	Most of the existing large manufacturers of domestic refrigerators have completed CFC phase-out with assistance from the

	Multilateral Fund. The few remaining smaller sized manufacturers will complete their CFC phase-out through ongoing projects and through the National Phase-out Plan.
Commercial and industrial Refrigeration	The enterprises in this sub-sector are predominantly small and medium-sized and scattered throughout the country. So far several enterprises have been covered under the Montreal Protocol program. Many enterprises in this sub-sector remain to be addressed for CFC phase-out.
Residential & commercial air conditioning man.	This sub-sector does not consume CFCs, but predominantly uses HCFCs and HCFC blends, mainly HCFC-22.
Mobile Air Conditioning manufacturing	Until 1999 Iran had an indigenous manufacturer for MAC equipment. This manufacturer produced until its closure with CFC. After closure of the factory no CFC is used anymore for MAC manufacturing. Since then the factory only does assembly.
Chiller manufacturing	There is no indigenous manufacturing capacity for central air conditioning centrifugal chillers in Iran.
Refrigeration Assembly	
Commercial	There are a significant number of enterprises, which assemble refrigeration equipment. They do not use own production lines for intermediate goods. The enterprises assemble and install only prefabricated refrigeration systems of local and imported origin (mainly from local refrigeration equipment and foam manufacturers). They work often as an independent contractor and installation is outside the premises of a refrigeration equipment manufacturer. The use of CFC refrigerant is specified by the manufacturer of the refrigeration unit or the choice of the customer; Since there is no production line, these enterprises had been not included in inventories of the past to establish levels of production and consumption.
Servicing of stationary refrigeration and air conditioning units	
Domestic & commercial refrigeration	Comprises of service enterprises, serving the existing population of domestic and commercial refrigeration appliances and equipment. The estimated number of such establishments is about 10,000. A phase-out plan for the servicing sector is included in the NPPP.
Residential and commercial air conditioning	As noted above, this sub-sector does not have CFC consumption.
Chillers	This being addressed through the servicing sector phase-out plan.
Other Applications	- Cold storage and Food Processing Equipment - Industrial Refrigeration Servicing.
Servicing of mobile refrigeration and air conditioning units	
- Car AC servicing - Bus AC Servicing - Train AC Servicing - Passenger Ships/ Boats AC - Transport Refrigeration	A pilot/demonstration program is under implementation in cooperation with France. About 350 ODP T still needs to be addressed.

Table 4.2 Current CFC phase-out status in the Refrigeration Sector

4.1.2 Refrigeration Assembly and Manufacturing Background

General

The ODS phase-out activities in this sector in Iran began in 1993. Since then, several investment projects in the domestic and commercial refrigeration sub-sectors have been approved, several completed and many are under implementation.

The range of products manufactured in the sector includes, household refrigerating appliances such as domestic refrigerators and freezers, commercial refrigeration equipment such as display cabinets, bottle coolers, chest freezers, hot and cold water dispensers, visi-coolers, reach-in refrigerators, supermarket equipment, walk-in coolers and freezers and industrial refrigeration equipment such as cold storage and transport refrigeration systems and process chilling and freezing systems. The Refrigeration Sector in Iran has experienced significant growth in the past decade due to the consistent growth in the per capita incomes, the predominance of the service industry and the relatively low market penetration of refrigeration appliances and equipment in the past. CFCs are consumed as blowing agents (CFC-11) and refrigerants (CFC-12, R-502, R- 22, etc) in the manufacture of refrigeration and air-conditioning products.

Supply industry

There are two indigenous manufacturers of hermetic refrigeration compressors in Iran, which produce compressors suitable for domestic refrigeration appliances using CFC-12 technology and are presently undergoing conversion process. Their combined production is estimated to be about one million units annually, which meets only a part of the domestic demand, the balance being imported.

The hermetic and semi-hermetic compressors required by the commercial refrigeration sub-sector are predominantly imported. Refrigerants and the blowing agents are also not manufactured in Iran and the domestic requirements are met through imports from producers in India, China, Europe, etc. The chemicals required for producing the polyurethane foam insulation are also imported from developed countries and supplied mostly through distributors, indenting agents and systems houses.

The ODS phase-out activities in this sector in Iran began in 1993. Since then, several investment projects in the domestic and commercial refrigeration sub-sectors have been approved, several completed and many under implementation.

The other refrigeration system components are partly produced indigenously and partly imported. Considering the geography and size of the country, the availability of upstream supplies in general is satisfactory, however the quality and level of customer service and technical support is quite limited, mainly due to inadequate infrastructure and due to insufficient availability of trained and qualified staff.

History of sector phase out

Domestic Refrigeration (DR)

The MLF has so far approved a total of 29 domestic refrigerator projects in the amount of $16.2 million for the I.R. of Iran. These projects are expected to phase-out about 1,477 ODP tons. However, the first set of projects approved in 1993 and 1995 comprising 11 enterprises accounted for 76% of total approved domestic projects or 1,129 ODP tons. Conversion of these large enterprises has been completed, and production of non-CFC refrigerators has started.

The technology adopted in this sub-sector is cyclo-pentane for the foam part, and HFC-134a for the refrigeration part. The total production capacity of these companies for non-CFC refrigerators is approximately 1,070,000 units per year.

Even though the large manufacturers and some medium-sized manufacturers have already been converted or are in the process of converting to CFC-free technology, there are a number of medium-sized manufacturers, who are yet not addressed.

Status of MLF Approved Projects	Number of Projects	ODP Tons to be phased-out by projects
Completed Projects	3	1,129
On-going Projects	26	347.6
Total	**29**	**1,476.6**

Table 4.3 Status of MLF Approved Projects - Domestic Refrigeration Sector

Commercial Refrigeration (CR)

The commercial refrigeration in the I.R. of Iran consists of a large number of small and medium size enterprises scattered throughout the country. It is estimated that there are a total of 400,000 commercial refrigeration units in use. This sub-sector is generally labour-intensive operation with limited amount of investment, and little knowledge of recent technologies. As of end 2002 MLF had approved a total of 46 projects for a total grant of about $11.9 million, and phase-out target of 1,108 ODP tons. So far about 46% of CR projects have been completed and have phased out about 572.5 ODP tons or 76% of the consumption of the funded projects.

The technology chosen for conversion of the commercial refrigeration projects to non-CFC-based system has been HCFC-141b for foam part, and HFC-134a for the refrigeration part. Most of the medium-sized manufacturers have converted to or are in the process of converting to CFC-free technology with MLF assistance. The remaining small and medium-sized enterprises in the sub-sector are geographically scattered and have relatively little access to sophisticated technology and practices. Low levels of investments in plant and machinery and resulting labor-intensive operation characterize these enterprises.

Status of MLF Approved Projects	Number of Projects	ODP Tons to be phased-out by projects
Completed Projects*)	12	572.6
On-going Projects	33	535.4
Total	**45**	**1,107.9**

*) Projects under “Status” “COM” and “FIN”

Table 4.4 Status of MLF Approved Projects - Commercial Refrigeration Sector

Although general awareness about quality assurance, training**,** environment and safety-related issues exists, it does not receive much emphasis in practice, due to low levels of operating capital and the low scale of operation and the pressures on profitability exerted by the very competitive domestic market as well as cheap imports. In general, the knowledge of the latest chemicals and technologies is limited in the enterprises. The industrial and transport refrigeration sub-sectors are relatively small, and also comprise of similar small and medium-sized enterprises as described earlier, however most of these enterprises also manufacture commercial refrigeration equipment.

There is a relatively large and fast growing servicing sector comprising of a significant number of large and small servicing establishments, with predominantly labor-intensive operations.
The I.R. Iran has been able to follow the phase-out schedule set in the country program.

Remaining enterprises in the sector
The domestic manufacturers of household refrigerators and freezers are generally better organized than the other sectors. The enterprises in the commercial and industrial refrigeration sub-sectors typically manufacture and/or assemble equipment such as chest freezers, display cabinets, bottle coolers, visi-coolers, reach-in refrigerators, hot/cold water dispensers, etc, serving the users in the hospitality and food service industry. The enterprises also manufacture and/or assemble process refrigeration systems, supermarket refrigeration systems and equipment, walk-in coolers/freezers, cold rooms, etc.

34 enterprises are typical manufacturers engaged in foaming. 28 enterprises use hand-mixing or partly low-pressure dispensers mainly, sometimes only to fix and join prefabricated parts, 30 do not any foaming at all. Those altogether 58 enterprises do predominantly assembly.

Medium-sized enterprises typically have semi-automatic charging units, vacuum pumps and leak detectors suited for CFC-12. SMEs and micro enterprises/assemblers mostly have assorted charging kits and vacuum pumps, suited for CFC-12.

Out of the 92 enterprises identified, 58 are doing predominantly assembly and have not been identified as manufacturers before. This large group of enterprises involves mainly in the assembly, installation and charging of refrigeration equipment. This subgroup has only been identified during the most recent survey in the refrigeration sector. Historically the NOU had registered only enterprises purely engaged in refrigeration manufacturing activities, excluding those who are doing assembly. Therefore they have never been considered in the reporting so far.

The group of assemblers can be categorized into 2 groups:
- Enterprises that do only assembly, installation and charging of refrigeration equipment,
- Enterprises engaged in both type of activities, assembly and refrigeration manufacturing and who often possess own foaming machinery, but still doing predominantly assembly.

In order to assess the funding requirements of this groups, the incremental cost have been applied as advised under Excom decisions 31/61, 31/31/45 and 31/54.

Mobile Air-Conditioning (MAC) – Manufacturing & Installation Sector Background

Until 1999 Iran had an indigenous manufacturer for MAC equipment. This manufacturer produced until its closure with CFC. After closure of the factory no CFC is used anymore for MAC manufacturing. Since then the factory only does assembly of MAC units with 134a.

Compressor manufacturing

There are two local manufacturers of hermetic refrigeration compressors, Iran Compressor and Padena Hermetic Compressor, which produce CFC-12 based technology compressor for domestic refrigerators. A project for conversion of Iran Compressor production facilities to Non-CFC technology was approved at the 28th Meeting of the ExCom (Replacement of CFC-12 refrigerant by HFC-134a at Iran Compressor Manufacturing Company (ICMC), IRA/REF/28/INV/51). The project, which is being implemented by UNIDO and was expected to be completed by August 2001, is still ongoing.

Padena Hermetic (ex Pars) Compressor production facility is to be converted with Japanese bilateral assistance. Upon completion of conversion to non-CFC technology, these two enterprises would have the capacity to produce two million compressors to fulfil part of the demand in the country, and the balance would continue to be imported. The hermetic and semi-hermetic compressors used for commercial refrigeration are mostly imported. A detailed description of the company can be found in the Annex VI.

4.1.3 Refrigeration Servicing for Stationary Units - Sector Background

General description of workshops

Based on phase one of the RMP project (Collection of Data) and survey carried out in 2001, there are approximately 8,000 refrigeration and air-conditioning service shops registered with the Association and Cooperative Bureau of Home and Commercial Appliances Centre. In addition an estimated 2,000 service shops exist that are not officially registered. The total 10,000 service shops throughout Iran territory are employing approximately 25,000 skilled and non-skilled technicians and workers. In

addition to domestic/commercial service shops it is estimated that there are approximately 917 MAC service shops in Iran, which employ an additional 2,000 technicians and workers.

Of these employees, including workshop managers, it is estimated that 5,000 have basic refrigeration and air-conditioning related training. The rest have gained their skills through on-the-job training and experience or through in short courses arranged by vocational training centres. However, the quality of training is often relatively low because the facilities available at the training centres are poor.

In general the current maintenance standards of domestic and commercial refrigeration equipment are poor. When refilling equipment, the actual refrigerant volume used is 2-3 times the final charge volume. Maintenance workshops often have no leak detectors and refrigerant is commonly used for component cleaning and system flushing. Large industrial installations are usually serviced regularly, but commercial difficulties often result in lowering the standards by using non-professional operators. There are no recovery and recycling activities as such and used refrigerants are always vented to the atmosphere even if the charge is recoverable. Therefore, a definite need for an application in recovery and recycling technology in the servicing sub sector exists.

A survey carried out by UNIDO indicated that most workshops are small (20 to 60 m^2) and are employing 2 to 4 people. They are generally not specialized or concerned with any particular type of refrigeration equipment and use only rudimentary equipment. About 90% of service shops do not have vacuum pumps or leak detectors. The fact that compressors designed for HFC-134a can (at least temporarily) run on CFC-12 has led to confusion as there is a temptation to use HFC-134a in compressors designed for CFC 12 which will quickly lead to a functional failure.

During the same survey, it was observed that due to lack of training and knowledge some of service shops replaced compressor R134a with R12, which they imposed a great loss to the equipment owners. However, some of the workshop managers have some awareness of ozone issues but little knowledge of the different characteristics of new refrigerants. The major Iranian home appliance manufacturers conducted several training courses for their own after sale services.
Except some seminars and training workshops held by NOU and major domestic refrigerator manufacturer, no investment project documents for training of the service sector were foreseen by MP Executive committee.

I.R. Iran has 28 major provinces and each province has its own state controlled and private vocational schools. Vocational and technical education centre a division of ministry of Labour runs and controls more than 400 technical training centres in different cities and towns. Many skill courses are annually conducted by these centres and the participants receive licenses from the centres. According to the information received from ministry of education there are 68 state vocational and 50 private schools in 28 provinces, which about 450 students are studying Refrigeration and Heating.

In Tehran 50 students have graduated from vocational schools each year. Additionally, the Ministry of Labour and Social Affairs runs more than 400 training centres in different cities. They train technicians and workers of repair and service shops, which require official certificates from the ministry.

The vocational training centres located in all major towns have teaching and instruction capacity, but lack generally demonstration equipment, as mentioned above. Some training centres in major cities of provinces are equipped with some basic demonstration equipment. Thus, people participating in refrigeration related courses have to learn the actual skills on-the-job.

Applications and refrigerants used for servicing of stationary units

It is estimated that more than 25,000,000 different type of equipments containing CFCs (20,000,000 units are being used as home appliances and 5,000,000 appliances as commercial, industrial, mobile AC, transport, Chillers, air-conditioning and end users), which are in use in different sectors

containing 11,500 metric tons (average 200 grams per units for domestic use and 1,500 grams per unit for other applications) of different ODS.

Servicing of stationary units concerns all existing refrigeration and air-conditioning equipment which is as follows:

Sector description	Details	CFC use in %	Units
Domestic refrigerators		> 90 %	20,000,000
20% of 4,500,000 houses in Iran are using different type of coolers, which it is estimated that 20% of them are using window and split type of **air conditioning systems.**	HCFC is the main refrigerants for this type of air conditioners.	< 10 %	900,000
Hotels	Refrigerator units	> 90 %.	59,480
Central Air Conditioning system buildings, Cold Stores, and **Industrial Cooling System** of which an estimated 10% are consuming CFC-12 and CFC-11 as refrigerant.	Average annual consumption of CFC-12, and CFC-11 for flushing, refilling, charging, and repair is estimated as 20 kg. per unit installed, which comes up with 160,000 x 10% x 20 = 320,000 Kg. = 320 Metric Tons.	10 %	160,000
There are approximately 120,000 registered and non registered Shops, Supermarkets, Restaurants, Butcheries, Coffee shops, Groceries, Milk Products etc., which use **commercial refrigerator appliances**.	Shops use an average of two refrigeration appliances.	> 90 %	240,000

Sources: Statistical Center of Iran, Iran Annual Statistics for 1998

Table 4.5 Existing refrigeration and air-conditioning equipment

The overall consumption (in metric tons) of CFCs and HCFCs used for of Servicing Stationary Units is:

Application	**CFCs**	**HCFCs**
Service/Repair/Purge	475	139

Table 4.6 CFCs and HCFCs used for servicing

Maintenance and servicing for domestics, commercials, and industrial equipment in Iran is supplied by about 10,000 service workshops, which are spread all around the country. The average life times of appliances in this category are between 10 – 15 years.

Normally due to refrigeration cycle leakage and compressor unit burn out failures, which are the most common defects occurred during lifetime of refrigerator appliances, 80% of the units are refilled with CFC-12 refrigerants.

Small repair and maintenance engineering companies supply different kind of services to the Chillers, Cold stores, Air Conditioning System. These types of equipment are normally serviced and repaired

by maintenance engineers and technicians. Depending on status of the equipment the refrigeration system circuit refilled and recharged during annual service. Average amount of ODS to be recharged is between 20% to 50% of total equipment ODS content.

Small service workshops service and repair different types of air conditioners (window type and Split Units). HCFC-22 is the most common refrigerant, which is used in window type air conditioner and split units.

CFC servicing for domestic refrigeration
Domestic refrigerators are continuously repaired and their lifetime is extended to the outmost possible. 20 years of operation can be commonly found. New CFC-free, mainly HFC-134a run domestic and small commercial equipment is entering in the market, and starting to have a small effect reducing CFC volumes needed for servicing.

Servicing needs for the Hotel sector
Two stars hotel do not have restaurant and air conditioning system, Water Evaporative coolers, so called desert coolers are the most common devices for cooling rooms there is no restaurant and cold store in these hotels.

Three star hotels have at least one restaurant, and most of them are using Desert Coolers, but in Southern Region of Iran which the ambient temperature and relative humidity are high, the most cooling device are Window Type Air Conditioner using R22 as refrigerant. Commercial refrigerator/freezer type (usually Upright Refrigerator/Freezer) is the most common appliance for storing foods and drinks.

Four Stars hotels have restaurants, and two above and below zero cold stores are used for storing food materials and drinks. Depending on number of rooms chillers are used for air conditioning using R22 as refrigerants and window type air conditioners are also used.

There are only 9 five stars hotels in Iran, which are mainly located in major cities such as Tehran, Shiraz, Meshed, Isfahan, and Mazandaran. Depending on number of rooms and facilities there are two or three restaurants each hotel has two cold stores for keeping fresh and frozen food materials. Room air condition systems are using usually Ammoniac and absorption systems Lithium Bromide as refrigerants.

No foreign investment has been done on tourism since 1979 and during last 23 years only one five stars hotel and few four stars were built. No economical trend could be provided, because no significant development in this sector is observed during last 20 years.

CFC service for commercial refrigerator appliances
The largest single amounts of CFCs are consumed in the commercial refrigeration sector. The remaining refrigeration plants installed throughout Iran are in relatively poor condition, particularly in the industrial and commercial sub sectors. Maintenance standards are generally low and refrigerant leakage is very high and estimates show annual leakage rates of more than 80% for various applications. Retrofitting of the larger equipment has been discussed for preparation of new investment project document when preparing this document.

The completed and ongoing projects are under close monitoring and survey by NOU to insure proper servicing capacity is built. Due to significant cooling properties of R12, this refrigerant is widely used for cold stores above 800 tones of capacity. It is estimated that 20% of total cold stores are using R12 refrigerant and 80% are using HCFC and blends as refrigerant Ammoniac.

	CFC	**HCFC**	**TOTAL (kg)**
Maintenance	6,400	158,400	164,800
Chiller/Cooling System Containing	38,400	158,400	196,800

Refrigerant			
Total	44,800	316,800	361,600

Table 4.7 Estimated ODS consumption at different Cold Stores for different applications in Year 2000

The average annual consumption of refrigerant is estimated 200 kg for maintenance & repair. Depending on the cooling capacity and net volume of cooling system, average amount of refrigerant which is annually charged to the cooling system varies from 200 up to 3,000 kg per unit.

	Number	**Area**	**Storing Volume Capacity (m3)**	**Annual capacity Mt.**
One circuit bellow zero °	247	67,294	373,398	80,079
One circuit above zero °	1,699	404,298	2,069.711	499,068
Total	1,946	471,592	375,467,711	179,147

Table 4.8 Type of Cold stores in Iran in year 2000

Detailed lists of cold stores their capacities and uses can be found in the annex VII.

Servicing of air conditioning equipment
CFC containing stationary air conditioning equipment is uncommon today, even though it can still be found in many places. The number of new air-conditioning devices is significantly increasing. New window type and split units were manufactured imported and sold by local manufacturers during recent years. New units run on HCFC-22 and centralized CFC-11 based chiller systems are now very uncommon.

4.1.4 Refrigeration servicing for Mobile units (MAC) –Sector Background

General background

The total consumption for MAC servicing sector in 2000 was reported to be 350 ODP Tons of CFC. However expert estimates show that a minimum of 575 ODP tons are expected to be consumed in the sector.

According to data reported by the I.R. of Iran, automotive industry has increased by over 223% between 1993 and 2000. This rapid growth could be attributed to: (i) rapid expansion of the cities and greater demand for cars despite its high cost relative to average income level, (ii) population growth; (iii) limited availability and access to public transportation; and (iv) young population who are eager to drive (about 60% of the population in Iran is below age 25), and (v) heavy concentration of jobs in cities.

There is no accurate number on the percentages of vehicles in the I.R. of Iran that are equipped with CFC MAC system. MAC and refrigeration systems in buses, Lorries, and trucks are estimated to be mostly CFC- 12 based. One of the largest car manufacturers, Peycan, used locally manufactured CFC 12 MAC units until 1999.

There are 917 registered MAC service shops in the country, generating employment for an estimated 2,000 technicians, and workers. The government of I.R. of Iran is concerned that ODS phase-out in this sector does not create economic hardship for this group of people.

The Caisse Francaise De Development (AFD) implemented a pilot MAC project in the I.R. of Iran, which was approved in 1998 under bilateral agreement. The project was implemented under a national

program for recovery and recycling of CFC-12 in the air-conditioning sector, and was completed in December 2002. The project, which had an indirect phase-out impact of 24 tons of CFC-12, equipped 50 selected automobile air conditioning service shops in Tehran. Based on the MAC pilot project the remaining 917 service shops need to be equipped with tools and training program in recovery and recycling techniques of different type of refrigerants.

The projected use of CFC-12 for MAC servicing without the activities of the NPP is shown below:

Year	2003	2004	2005	2006	2007	2008	2009	2010
Consumption w/o NPP	575	612	591	566	536	500	456	404

Table 4.9 Servicing Demand for the MAC Sector, ODP tons

From the estimated 575 ODP tons used in 2003, 326 tons have been registered import. It is very difficult to assess were the remaining consumption enters from. Part of it may well be coming from stocks resulting the phase out of CFC 12 in the refrigeration manufacturing sector.

Baseline consumption

Servicing of mobile units is an essential sector that is responsible for a large consumption of CFCs. Mostly workshops in this sector are specialized in servicing mobile units in the transportation sector including passenger cars, buses, trucks, trains, ships and transport containers. In a large country like Iran, under the given climatic circumstances, many of the services for commercial customers play a crucial role in maintaining important public and industrial activities. Mobile units, in specific, are often not accessible for repair for days and weeks. Therefore, the economic pressure to maintain reliable systems overrules widely the willingness to change the majority of CFC based devices to alternatives.

Alternatives need to be specifically designed for the required applications and technical assistance and training is crucial in order to meet the reliability criteria's, e.g. for the commercial applications. Therefore, the government of Iran has put a special interest in this sector.

Total population

The overall consumption is difficult to assess exactly and can only be assessed by estimate. According to the NOU there were 600,000 cars with MAC systems (out of 4 Mio vehicles) in 1999 (the year when CFC MAC unit production was stopped). There were an additional 116,800 air conditioned buses and trucks in the country (total population 0.584 Mio).

It is noteworthy that the demand for private cars in January 2000 recorded at 367,222 indicating 27.2% of growth comparing with the figures of previous year. Presently, Iran produces about 500,000 vehicles annually and has a significantly increasing export rate. The largest consumption of CFC for servicing in the MAC sector is for servicing automobiles.

Although no exact statistics on the installation of MACs in cars are available, there is good reason to assume that the demand for MACs can be correlated with the demand of vehicles. And, with the presence of more MAC devices the respective use of CFCs for serving purposes is very likely.

The average refrigerant charge is 5 kg to 10 kg per unit. Good maintenance will reduce the service needs and result in a reduced refrigerant needed for the charge volume.

The following is an estimated total population of larger vehicles:

Item	In 1000 units
Buses	39
Minibus	18
Pick Ups	426
Trucks	75

Trailers	26

Table 4.10 Breakdown large consumers Mac sector

Source: Law Enforcement Forces of the Islamic Republic of Iran

Number of workshops

One of the main sources of the high level consumption of CFC-12 in the MAC sector are service shops that supply services to bus terminals during summer time mainly in Tehran, Eastern, Southern, and other parts of Iran. According to findings of the pilot project, each bus service workshop consumes approximately one ton/month CFC-12 from June to September each year. There are about 54 bus workshops supplying Air-Conditioning services in Iran. These service workshops can make a big impact if supplied with big recovery and recycling equipment.

The following illustrates the estimated proportional consumption of various types of workshops;

Consumer	**Consumption level**
54 Bus/Trucks Service Shops	200 -500 kg /month
388 Big workshops for Service of trains, planes, containers and ships	50 -200 kg /month
475 Small Automobile service shops	10 - 50 kg/month

Table 4.11 Proportional share of MAC workshops according to size

Estimated charges

Except for the main centers, road conditions in Iran are generally very rough and not comparable with for example European standards. In semi-urban and rural areas, dirt roads are still very common.

Therefore, MAC systems need to work under very strong vibrations and shocks following road conditions. All vehicles, especially buses and trucks (which are often overloaded) face much higher leakages, because the tubing and connections are affected very much under these rough conditions.

According to local experts and workshop owners, car systems need generally to be serviced at least once a year. If only applied in cities the charge can last up to two years. Buses and trucks are much more affected and even charges up to 3 times per year are not uncommon. As stated before, the current maintenance standards of refrigeration service enterprises are poor. When refilling equipment, the actual refrigerant volume used is often 2-3 times the final charge volume.

The table below illustrates minimum charging rates per year for various MAC types in Iran.

Applied minimum charge per year per MAC type

Vehicle Type	Charge in kg	Charging times/year	est. min. kg charge/per year
Cars	1	0.5 to 1	0.5
Trucks Bus	2-10	1 to 2	3
Trains	30	1 to 2	30
Ships	100	1 to 2	100

Table 4.12 Minimum annual CFC charge per MAC type

On above basis, the total consumption can be estimated on the total population of vehicles and the estimated percentage of users. The figures applied represent a minimum. It is very likely that the total amount of cars, trucks, buses, etc. using MAC will be much higher. The year applied has been 1999, because until then vehicles were equipped with locally manufactured CFC 12 MAC systems.

Total Population and Consumption in 1999

Equipment	Total population	CFC users	kg Charge/ year	Total CFC in kg
Cars	3,997,000.00	0.15	0.5	299,775

Trucks Bus	584,000.00	0.20	3.0	350,400
Trains	584.00	1.00	30.0	17,520
Ships	82.00	0.90	100.0	7,380
Total	**4,581,666.00**			**675,075**

Table 4.13 Proportional distribution of CFC consumption in the MAC sector in 1999

It is estimated that the minimum consumption of CFCs required for MAC services has been 675 ODP T for 1999 given on the total population of equipment, local conditions and service practices. Based on the annual retirement rate for MAC systems the consumption for 2003 is estimated to be 575 ODP tonnes.

Apart from the 917 specialised service shops, there is also a number of additional small service shops that provide occasional service for MAC, but not as a major activity of their business. Those are mostly covered under the RMP. It is estimated that the specialised shops cover more than 80 % of all MAC services delivered in this sector.

Final production of CFC based Mac systems in the country
Manufacturing of CFC based MAC systems was closed in 1999 only. The production was mainly for Peycan cars, which is the main manufacturer in Iran. There are no reliable figures on the production range.

Servicing of mobile units in trains
In total Iran Railways maintains air conditioned 584 wagons all from the early 60s. The charging volume is 20kg/unit. The annual losses are stated to be very high (150 – 200%). In total the estimated annual consumption is 17 ODP T.

Servicing of mobile units in ships
Approximately 20% of different types of ships, boats and launches are using cold stores for different purposes, average use of ODS being used at their cooling system is estimated to be 50 kg. Total estimated CFC and HCFC at ships, boats and launches are 104 metric tons (see detailed list in the Annex VII).

Existing projects in The MAC sector

In 1998, the Islamic Republic of Iran and Cassie Francaise De Developpement signed a financial agreement to implement a Pilot MAC Project. This project was implemented in Tehran under a national program for recovery and recycling of CFC-12 in the air conditioning sector, financed by France, in the framework of the Multilateral Fund.

The total project cost was 1,976,700 French Francs. The project consisted of two parts
- training program with a total estimated budget of 192,000 FF, and
- Pilot project for CFC recovery and recycling with a total estimated budget of 1,425,000 FF.

The Ozone Office of Iran signed a contract with a local Engineering Company to supply equipment to 50 selected automobile air conditioning service shops in Tehran as well as a railway company. The project was successfully implemented and completed in December 2002. A final evaluation of the workshops has not been finalised by the time of the NPP preparation.

However, informal talks with workshop owners indicated that the need for training was especially high. There is still comparatively little knowledge on best practises such as drop-ins, retrofit and replacement of CFC systems. But also environmental and good housekeeping guidelines were mentioned as important motivational aspects for the participation of technicians.

4.2 Foam sector

Introduction
The Foam Sector in Iran accounts for about 47% of Iran's baseline CFC consumption in 2000. Since 1993, until December 2002, a total of 25 investment projects in the foam sector have been funded under the Montreal Protocol mechanism**,** implemented by UNDP, UNIDO and GTZ. The detailed list of investment projects approved in this sector till end-2002 is attached in Annex XIII. The summary of approved investment projects is as below:

Status of MLF approved projects	No. of projects	ODS phase out by the projects CFC-11
Completed projects	5	1,231.8*
On-going projects	20	1,282.6
Total	**25**	**2,513.4**

*includes the consumption of a closed project (Nobough), which had been converted on its own cost after being transferred to a new owner.

Table 4.14 Status of already approved foam projects

Manufacturers
The CP stated in 1991, that the foam industry produced 40,264 tons of flexible and rigid PU foam only (without significant inclusion of the automotive part sector). The estimate was based on the data from 11 large and eight small foam companies. In order to rapidly reduce the large consumption of CFC, the priority for foam projects was given to continuous rigid PU foam. In recent years foam consumption has been composed of four sub-sectors: (i) flexible, (ii) rigid, (iii) moulded/integral skin, and (iv) polystyrene, however, information of such breakdown was not available in the original CP. Polystyrene companies have not indicated any use of CFCs.

The policy of the government has been very successful in promoting long-term solutions to the use of CFC in the foam sector. In the rigid foam sector the use of pentane as a blowing agent in larger productions of sandwich panels and other rigid foams has become the new standard. Five companies in the rigid foam sector with a total of 1231.8 ODP tons have been successfully completed and converted.

The automotive sector with its special requirements for integral skins and molded foams has received special attention by the government. Iran produces presently 500,000 vehicles annually and has an significantly increasing export rate. Cars are exported mainly to neighboring countries in the region, including Turkey. With the emerging European market next-door, Iranian car producers and their local suppliers of foamed products need to match ISO 9000 and the new European regulations. For the higher standard integral skin products, pentane based systems have been successfully introduced.

For molded flexible foams water based systems have been successfully tried and applied and will become the standard throughout the sector. One project has been completed and four are under implementation.

For the production of flexible slabstock the use of liquefied carbon dioxide has been favored and established as the state of the art for flexible foams. After some initial problems with the establishment of the LCD technology, in 2002 the first company has successfully converted to foaming with CO2. Altogether there are 10 LCD projects in Iran. Many of them are in the process of starting to produce with CO2. Problems, like the availability of appropriate CO2 tanks, have now been solved after local manufacturers have reacted to this new demand. The government has refused to apply MC technology in the sector.

Products
Furniture and bedding companies produce flexible slab stock and moulded foams for cushions, mattresses, pillows, etc. In refrigeration, foams are used in refrigerators, freezers, refrigerated display cabinets/counters, trucks, industrial cold storage facilities, etc. The automotive industry includes

flexible moulded and integral skin foams for seats, backs, steering wheels, headrests, arm rests, carpet backing, sound insulation and many other applications. The building and construction sector includes rigid blocks, commercial refrigeration supplies, panels for thermal insulation of buildings, thermally insulated roof panels, as well as the manufacturers and users of spray and/or injection processes. Other miscellaneous applications include bicycle and motorcycle seats, lunch pails, thermos flasks, surfboards, ornamentals, and packaging.

Supply of raw materials

The raw material supply statistics of suppliers indicate that they supply in Iran 31,300 T of materials. This however, does not cover the total supply in the country, because large foam producers import directly themselves, mostly from Dubai and Europe. They often do also supply other factories, especially in the rigid and flexible slab stock sub sector. Therefore, the consumption stated by the suppliers rather represents the consumption of medium- and small-scale manufacturers.

Sector	Raw Material Sales of local dealers	Discount local Supply vs. Direct import	Estimated total production	Remaining of total consumption	Use of CFC as part of raw materials	Estimated remaining CFC subsector consumption
Rigid Foam	6,000	0.4	15,000	0.14	0.10	217
Molded/Integral	7,000	0.7	10,000	0.51	0.09	459
Shoes	4,500	1.0	4,500	n.a.	0.00	0
Flexible slabstock/boxfoam	14,300	0.6	23,833	0.20	0.10	468
Total	**31,300**		**53,333**			**1,144**

Table 4.15 Estimates based on raw material supply of suppliers

Sector	From already Approved	New	Total	Estimated total present production
Rigid	5,479	2,889	8,368	15,000
Molded/Integral	3,086	2,661	5,746	10,000
Flexible Bloc	13,030	8,613	21,643	23,833
Total	**21,594**	**14,163**	**35,757**	**48,833**

Table 4.16 Total Foam Production in T from projects approved and newly requested projects

The CFC originates mainly from India, UAE, France, Italy and China. In contrary to the polyol and isocyanates, CFC is sold almost exclusively through local market suppliers, which makes it difficult to identify the origin of the import at end user level. Additional supply of local markets through unregistered imports cannot be ruled out completely.

History of ODS Phase Out in the sector

The latest reported consumption in 2001 was reported to be 1,515.5 ODP T. The ongoing consumption from approved but not implemented projects is 1,282.6 ODP T. The total amount of approved foam projects for Iran amounts to 2,513.4 ODP T.

Latest available consumption for all CFC 11 was 2,596 ODP T for the year 2003. The remaining fundable consumption in the sector based on the selected option 2 is 202.6 ODP T. The actual identified consumption of the remaining enterprises in the sector is much higher. In the absence of a country program update, the foam sector survey has been the first in depth study to verify the consumption level in the sector.

Foam sub-sector phase out in Iran	ODP to be phased out (T)

		CFC-11
PU Rigid foam:	Sandwich panels	1,155.60
	Insulating boards, doors, panels etc.	240.00
	Spray foam	-
PU Flexible foam:	Moulded foam / Integral skin	185.90
	Slab stock	923.53
Polystyrene/Polyethylen		-
Total		**2,513.4**

Table 4.17 ODP to be phased out by MLF approved projects in foam sector, according to sub-sectors

Year	**2004**	**2005**	**2006**	**Total**
ODP Tonnes	825.6	382.4	73.6	1,282.6

Table 4.18 CFC to be phased out by on-going MLF approved projects in the foam sector

The following table provides an overview on the approved projects in the foam sector (detailed list in Annex XIII)

Code	Subsector	Enterprise	Impact	Status
IRA/FOA/ 17/INV/11	Rigid	Fabis, Iran Steel, Mammoth Teheran, F.M., and Urethane S.C.*	1,200.0	COM
32/INV/75	Rigid	Nobough Industrial Co.	31.8	CLO
22/INV/20	Flexible slabstock	Safoam Co.	120.0	ONG
22/INV/21	Flexible slabstock	Urethane Systems Company (USC)	110.0	ONG
22/INV/22	Flexible slabstock	Shizar Co.	120.0	ONG
23/INV/29	Flexible slabstock	Mashhad Foam	90.0	ONG
28/INV/50	Flexible slabstock	Bahman Plastic Co.	83.0	ONG
31/INV/73	Rigid	Rashestan Co.	70.0	ONG
32/INV/76	Integral skin	Iran Polyurethane Manufacturing Co	51.8	ONG
34/INV/114	Flexible slabstock	Iranogharb	62.0	ONG
34/INV/88	Integral skin	Abre Sanati Iran	47.5	ONG
35/INV/115	Flexible slabstock	Abre Shomal, Co.	90.4	ONG
35/INV/116	Flexible slabstock	Esfanj Jajerood foam company	89.0	ONG
35/INV/117	Integral skin	Sandalisazi Esfanje Ghalebi Iran	22.4	ONG
37/INV/149	Flexible slabstock	Esfanj Shirvan Co.	91.1	ONG
37/INV/150	Integral skin	Jahad Tahghihat Group	23.0	ONG
37/INV/151	Flexible slabstock	Abre Baspar foam company	77.0	ONG
37/INV/152	Integral skin	Sanayeh Dashboard Iran	22.0	ONG
37/INV/153	Integral skin	Nikou Esfandj	18.6	ONG
37/INV/155	Rigid	Yakhchavan Co.	73.6	ONG
37/INV/156	Rigid	Phira Khodro	20.2	ONG
		Total	**2,513.4**	

*5 individual projects are grouped under 1 code

** CFC phased out without funding by new owner

Table 4.19 Overview approved projects in the foam sector

4.3 Aerosol Sector

4.3.1 Non-Medical use

Iran with its almost 70 million populations is one of the high rate consumers of different kinds of Aerosol Products in the region. Historically aerosols are used for insect killers, inhalers, cosmetics, aerosol mould release agents including solvents and active ingredients, propellants and aerosol cleaners.

According to the survey conducted by a local company in Iran, 50 different producers are producing these types of aerosols in Iran. The majority of the producers have already made conversion of their production to ozone friendly propellant following international developments and on request of the government, many of them already before Iran finally signed the MP.

CFC-12 was widely used as propellant and CFC-11 as suspension agent to keep heavy materials suspended in the final products. The alternative propellant to replace CFC-12 is that of different types of hydrocarbons such as Butane and others. Today some insignificant amounts of CFC-12 are still marginally used as mould release agent, dust remover, printed board cleaner, fluxes remover, etc.

4.3.2 Medical uses

The CFC MDI (metered dose inhalers) for treatment of asthma and other respiratory diseases has been declared an "essential use" of CFCs under the Montreal Protocol, because it is vital to public health and there is no other therapy that can take its place.

The MDI is a pocket seized hand-held, pressurized multiple-dose inhalation delivery system. It delivers small, precisely measured therapeutic doses, greatly minimizing the risk of side effects.

The essential components of an MDI are a storage canister, a medical formulation, including at least the propellant, the active ingredient(s), surfactants and co-solvents; a metering valve to control the discharge of precise doses of formulation; and an actuator. The propellant mixture is made of one or more liquefied gases, which generate the pressure.

CFC for MDIs constitutes a highly successful balance of complex forces. A change in one element of the system, the propellant, requires changes in varying degrees in others. The closest functional replacements for CFC-11 and CFC-12 are HFC-134a and HFC-227ea.

The major steps in the HFC MDI development process are roughly as follows:

- Selection of HFC propellant
- Formulation development using HFC propellant
- Toxicology studies on alternative HFC propellant
- Component and package development (valve, elastomer, etc.)
- Toxicology studies of new HFC-based formulation
- Stability testing on finished MDI product
- Clinical studies on new formulation (tests in humans)
- Regulatory review and approval
- Market introduction

Where possible, certain steps can be taken in parallel. However, some steps can be begun only when others have been completed. For example, formal toxicology studies on the formulation cannot begin until the formulation and components have been identified. The major manufactures of medical CFCs and HFCs are Du Pont, ICI and Solvay.

All the remaining CFC consumption reported in the aerosol sector is for the manufacture of aerosol MDIs. The CFCs used in the manufacture of MDIs are CFC 11, CFC 12. Iran had reported the annual CFC consumption for MDI in 2000, comprised of the following individual CFCs:

CFC 12	33 ODP tons
CFC 11	17 ODP tons

A recent survey conducted at the largest inhaler producer in Iran is Sina Darou Company has shown that the present consumption is altogether 93 metric tonnes of CFC-11 as suspension process agent and CFC-12 as propellant. Sina Darou Company is the largest producer in Iran in this field of activity and in 2002 the company produced 3,600,000 inhaler cans. It is a private company, which was

established in 1972 and it has 80% market share of Iran. Salbetamul, Beklometazon, and Salmetrol are its main products, which are produced in 19 CC Aluminium Cans. It employs 295 workers in 4500 Sqmt. production halls. Discussions between the company and the NOU continue until an economic and safe solution can be found for conversion.

4.4 Solvent Sector

4.4.1 Background of the Solvent Sector

There is no local production of CTC, TCA or CFC-113 in the Islamic Republic of Iran. The Country Program (CP) revision in 1996 reported the use of three solvents in the Solvent Sector, namely carbon tetrachloride (CTC), methyl chloroform (TCA) and CFC-113. Reliable data on consumption was acquired in the frame of a solvent sector survey carried out by UNIDO, which has resulted in the inclusion of the CFC solvent component in the NPP and the preparation of a CTC/CTA Sector Phase Out Plan.

4.4.2 Base-line for the Solvent Sector

In Iran, CFC 113 consumption as solvents was principally for cleaning purposes in the electronics and precision engineering industries. The most commonly used solvents are CFC 113, 1,1,1-trichloroethane (TCA), and CTC. The latest reported consumption of CFC 113 reported was 62 ODP T in 2001. The latest consumption reported by the customs office for 2002 was 81 ODS tons or 64.8 ODP tons.

Iran – Solvent Sector Consumption of CFC 113 (ODP tons)					
1997	**1998**	**1999**	**2000**	**2001**	**2002**
15	10	10	10	62	64.8

Table 4.20 CFC 113 Consumption (ODP tons) 1997 – 2001

UNEP/Ozl.Pro/ExCom/38/58, Annex XIV lists the following quantities (ODP T, all Sectors, though CTC and TCA would be expected to be primarily or entirely in the Solvent Sector) as reported by Iran to the Ozone Secretariat:

ODS	**1998, ODP T**	**1999, ODP T**	**2000, ODP T**	**1998-2000 Baseline, ODP**
CTC	121.0	55.0	55.0	77.0
TCA	14.0	6.0	6.0	8.7

Table 4.21 CTC/TCA Consumption (ODP tons) 1997 – 2001

The latest survey on CTC/CTA indicate much higher figures, however no final figures have been available during drafting of the NPP. The cause for the heavily underreported figures in the solvent sector especially in the CTC/CTA sector is again in the inadequate data available from customs to the Ozone Office:

1) Significant quantities of certain imports are free of duties and tax. They are exempt from being reported to the Customs Administration, and so the data are not available to the Ozone Office from this source. These are:

- requirements of the armed forces,
- imports by certain other government departments, such as telecommunications,
- imports by private enterprises, which have been granted a time-limited exemption from duties and tax to encourage investment in designated geographical areas.

2) Institutional strengthening of the Customs Administration was implemented in 2001-2002, with the prime objective being the proper certification of ODS chemicals. This included the change to the harmonised system of customs codification. The “Import-Export Regulations of the Ministry of Commerce” established the Customs Codes for the monitoring of ODS imports and became available to Customs officials in March 2002. Therefore no reliable data on reportable imports of ODS could be obtained prior to mid-2002.

As a result of these factors, the NOU had to rely on informal contacts to develop data for the Solvent Sector. These contacts have covered but a minor fraction of the users of ODS. For this reason the recent survey was requested to strengthen the 2003 Country Update and assess the final consumption of CFC 113.

4.4.3 Use of CFC-113 as a solvent

Reliable data have not been available prior to 2000. The July 2002 edition of the records of the Customs Administration is the first to provide data on registered imports of CFC-113. These were 81 ODS T, i.e. 64.8 ODP T, in the period March 2000 to March 2001 .

CFC-113 consumption in the Solvent Sector is principally for cleaning purposes in the electronics and precision engineering industries. It is often used in the form of spray cans. Pars Electric declared 5 ODP T CFC-113 in spray cans, and Iran Compressor Manufacturing Company declared 40 ODP T CFC-113. Substitution efforts should also be directed towards the can fillers of which three have been identified.

The July 2003 edition of the customs administration records was not available at the time of preparation of this Plan. There are commercially available alternative technologies to replace CFC 113 and the remaining users need to be made aware of the replacement technologies, and the relevant regulations and legislation.

Due to the high price of CFC-113 this type of ODS solvent is not consumed by the private sector in big quantities in the country. The main Problem with CFC –113 is the evaporation loss in the electronics industry, which is very large. Most occurs during cleaning, the rest during recovery and other handling operations. In conventionally maintained plants, total recovered solvents consumed may be as low as 20 per cent. CFC-113's main advantage to the electronics industry as a non-corrosive solvent is less compelling now, due to the increasing use of more solvent-resistant assembly coatings.

Electronic assemblies can be specifically designed with aqueous cleaning in mind and military specifications are currently being changed to allow use of non-resin fluxes and aqueous cleaning. Replacement chemicals and technologies are already commercially available. The most environmentally sound alternative is the elimination of cleaning altogether. A number of fluxes and flux application technologies exist which make that alternative viable.

Many alternative solvents could replace CFC-113 in electronics cleaning, either single or in combination using different processes. Other chlorinated solvents such as trichloroethylene, perchloroethylene and methylene chloride have been used as effective cleaners for many years and have been extensively tested. However, in some countries, the first two are regulated as volatile organic compounds because they contribute to tropospheric ozone formation.

Hydrocarbon/surfactant solvents are mixtures of organic compounds and agents that reduce the surface tension of water thus improving the efficiency of water cleaning. Organic chemicals used in conjunction with surfactants include terpenes, alcohols, aldehydes and esters. They are non-corrosive, have low viscosity and foaming values, remove both polar and non-polar contaminants, and are useful for cleaning closely-spaced electronic assemblies at low temperatures. They do require specially designed explosion-proof equipment because of their low flash points and potential room temperature flammability; and because they are classified VOCs, their mists and vapours must be contained. These

blends can be used to clean all types of soldered assemblies and most electronic assembly components are compatible with most of them. Terpene wastes may be hazardous and require proper disposal to prevent further environmental problems. A new hydrocarbon/surfactant blend, ethyl lactate, is an excellent non-toxic cleaner, which mixes with water, but may deplete oxygen in discharged wastewater. Waste chemicals from these solvents have not yet been extensively tested.

Other organic solvents, such as ketones and alcohols, are effective in removing both solder fluxes and many polar contaminants. Being flammable and classified as VOCs, they can be used only in small quantities in well-ventilated areas. Isopropanol looks promising as a substitute and is an acceptable cleaner for activated rosin and other military-approved fluxes. Special equipment required for flammable alcohol-based solvents is now commercially available including cold solvent cleaners, hot solvent cleaners, vapour-phase batch cleaners, in-line cleaners and immersion cleaners. Most use ultrasonic agitation and/or sprays to achieve more thorough cleaning.

With respect to the facts and figures, it is estimated that additional undefined amounts of CFC-11, CFC-12 and CFC-113 are being consumed as suspension agent and solvent in different sub-sectors as MDI, Mould Release, Aerosol Cleaners, Aerosol Dust Removers, Printed Circuit Board Cleaners, Flux Removers and etc. The remaining CFC 113 solvents will be replaced in the frame of the NPP.

5 THE NATIONAL CFC PHASE OUT PLAN, STRATEGIES AND IMPACT

5.1 Introduction

The I.R. of Iran has decided to apply a performance-based national CFC phase-out plan (NPP) to eliminate the remaining CFC consumption in the country. This decision is in line with the ExCom Decision 35/57, and is based on the residual unaddressed ODS consumption. The proposed NPP project is to be implemented over a six-year period (2004-2009) with a complete phase-out of all CFCs, except for those eventual covered under the halon recycling and banking programs and MDIs. The phase out of HCFCs is not included in the NPP.

Despite the fact that a total of 21 foam and 84 refrigeration projects have been approved, and a large number of them have already been completed, these two sectors still account for major consumption of ODS in Iran. In order to comply with the Montreal Protocol, the Islamic Republic of Iran must freeze its consumption of the Annex A CFCs at 4,571 ODP tons by 2000 and then reduce this to 2,285 ODP tons by 2005 and 685.8 ODP tons by 2007, before complete phase-out by 2010.

The table below illustrates an overview of annual phase out targets for National CFC Phase Out Management Plan:

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**
Phase Out targets under the NPP				484.4	405.4	365.4	256.3	146.8	50.1		1,708.4
Expected impact of ongoing approved projects	151.1	116.0		1,120.0	988.0	73.0					2,448.1
Total CFC phase out targets/year	**151.1**	**116.0**		**1,604.4**	**1,393.4**	**438.4**	**256.3**	**146.8**	**50.1**		**4,156.5**

Table 5.1 Annual phase out targets for the NPP

The table below illustrates an overview of projected reduction of CFC consumption:

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Predicted annual reduction of eligible Consumption (by end of each year)	4,156.5	4,005.4	3,889.4	3,889.4	2,285.0	891.6	453.2	196.9	50.1	0.0
Maximum Consumption permitted by the Montreal Protocol (ODP tons)	4,571.0	4,571.0	4,571.0	4,571.0	2,285.0	2,285.0	685.0	685.0	685.0	

Table 5.2 Annual reduction of consumption under the NPP

It must also be noted that the projected annual reductions in CFC consumption from the completion of ongoing projects are based on the completion dates in the approved project documents. Experience shows that projects are often delayed, e.g. when the required counterpart funding from the recipient company necessary to complete the project may not be available.

The NPP will be implemented on the basis of five sector surveys and proposal preparation:

Sector	**Coordinating Implementing Agency**
Refrigeration Manufacturing	UNDP/UNIDO
Domestic/Commercial Servicing (RMP)	UNIDO
Foam	Germany
MAC service sector	France

Solvent Sector	Japan/UNDP
Compressor component*	Japan

** The Government of the Islamic Republic of Iran and the Government of Japan are discussing the inclusion of the conversion of the PARS COMPRESSOR MANUFACTURING COMPANY in the business plan of Japan, no fund is requested at this stage.*

Table 5.3 Major CFC phase out plans within the NPP

The following table illustrates the phase out targets in each of the sectors:

Sector	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Domestic/Commercial Servicing				130.0	125.0	125.0	55.0	25.0	15.0		475.0
Refrigeration Assembly/Manufacturing				89.8	120.8	56.1					266.8
Foam Sector Plan				120.8	118.7	140.9	127.0	68.4			575.8
MAC sector				79.0	86.0	90.0	40.0	21.0	10.0		326.0
Solvent Sector Plan				64.8							64.8

Table 5.4 Phase out targets of the different sectors

The following graph illustrates the targeted phase out schedule and compliance targets:

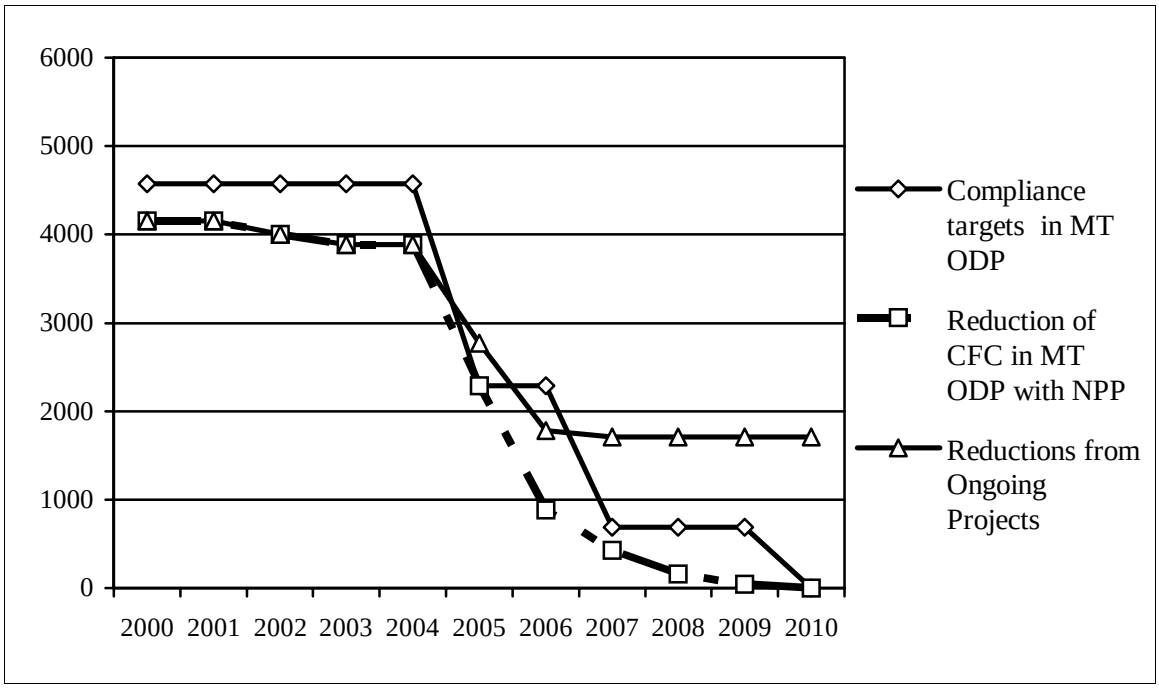


Figure 5.1 Targeted phase out schedule, compliance targets and projection of phase out from ongoing projects

It should be noted that while the table contains the amounts of CFC that are scheduled to be phased-out in each of the years 2001 – 2010, the full impact of the reduction will not be felt until the following year. The table has therefore been constructed to illustrate this as it is considered a more realistic forecast of future consumption. The graph shows that without the NPP the country will not be able to meet its 2005 and 2007 compliance targets.

5.2 Proposed Policies and Strategies

This National CFC Phase-out Project Proposal employs strategies to ensure compliance of the I.R. Iran with the Montreal Protocol CFC consumption compliance targets in 2005, 2007 and 2010. The strategies employed involve investment and non-investment activities, including public awareness, as well as a combination of policy and regulatory support through revision of the existing legislation and secure framework to both manufacturing enterprises and end-users to convert to non-CFC technologies.

It should be noted here that any measures to restrict the supply of CFCs simply by reductions in import quotas without assistance to reduce the demand in the service sector will have the following unacceptable consequences for Iranian stakeholders:

- CFCs will be hoarded and the availability of CFCs in the market will be significantly less than the amount permitted by the import quotas.
- CFC prices will rise accordingly and by significant margins.
- End-users will have to retire and replace equipment before its anticipated useful lifetime.
- There will be consequential losses resulting from spoilage of perishable refrigerated goods when equipment cannot be rapidly repaired due to non-availability of CFCs.
- A black market in CFCs can be anticipated fuelled by illegal imports of CFCs.

Therefore actions are required immediately to address the growing consumption of CFCs at the level of use, especially in the refrigeration and foam sectors.

The strategic action plan will include a combination of measures on sector and legislative level. Each level includes a number of typical elements that have been successfully applied under similar conditions in other countries.

Level of Action	**Elements of assistance:**
Industry sector: Assistance in the refrigeration, foam and solvent sector	• Investment projects for conversion of CFC based production and service industry • Training and Technical assistance for conversion • Trials, Demonstration of alternatives • Sector policy and management support • Awareness building on sector level (in production & service) • Networking with associations and stakeholders in the sector
Government Capacity Building in government organisation to provide supportive framework	• Funding assistance for monitoring and training equipment • Training for officers in customs and other key offices • Advice the government on national and sectoral policies • Assist in formulation of legislation and regulations
Public sector Non producing end users and consumers of CFCs or CFC containing products	• Awareness Building on restrictions on the use of CFCs, good practices, phase out schedules and regulatory aspects • Information campaigns on alternatives and end user

	guidance • Regulatory component
Project implementation	
Actions to support successful implementation of the Plan	• Management assistance for the implementation of the plan • Monitoring facilities to monitor, analyse and adjust progress and impact of the activities

Table 5.5 Strategic elements of the national action plan

Monitoring is also considered to ensure that those enterprises that have already converted to non-ODS technology go on applying the selected alternatives.

The size of the country, the huge inventory of existing CFC based equipment, and the number of manufacturing and servicing industries involved will require an integrated coordination of efforts on regional, industrial and public sector level.

Moreover Iran needs to apply a high degree of flexibility in the allocation of funds and react to demand, especially taking into consideration that the mechanism approved to determine the remaining fundable consumption does not necessarily take into consideration the real needs of the country. This has essential consequences for investment projects. Especially in the foam sector complete conversion will not be achievable without a strong support and commitment of the private sector.

Nevertheless to achieve significant and sustainable reductions in CFC consumption and meet the compliance in 2005, a series of investment and non-investment activities in the refrigeration, foam and solvent sector will need to be implemented as soon as possible.

A high degree of motivational work will be required to get the necessary support from all industrial sectors for these activities. The National Phase Out proposes several start-up activities in the sectors like national stakeholder workshops, which are crucial in generating support for the government actions and understanding among enterprises for the changes and importance of the NPP.

In the strategy great emphasis has been put on the non-investment activities in order to compensate for the lack of funds for required investments. These non-investments in the form of educational media, training and technical assistance activities are essential to lay the groundwork for enforcement of government regulations.

It is expected that finally deficits in available funds can only be compensated through regulatory and legislative measures. To avoid market distortion and avoid illegal use of CFCs, the Government will strengthen its monitoring and enforce existing legislation on the use of CFCs in all parts of the industrial manufacturing and servicing sectors as soon as possible and in line with technical and training assistance provided to the sectors.

The phase out dates proposed target a 90% reduction in 2007 and a final phase out by 2010. This integrates the needs of the industry for continued economic availability of CFCs, the overall economy in Iran and the new strategic planning frameworks and adjusted funding policies adopted by the Multilateral Fund.

These phase-out dates seem to be realistic, since the government has already started to lay the framework and preconditions for such a plan through

- Partial establishing of a licensing system for import of ODS from 2003,
- Ban on imports of certain types of ODS-based refrigeration compressors from 2002,
- Active participation in the preparation, implementation and monitoring for projects funded by MLF,

- Formulating guidelines and regulations as necessary for policy implementation,
- Supporting public awareness initiatives for promoting ozone layer protection at the consumer level for encouraging public involvement,

A better quality of import data is now also possible because of new national codification of all ODS imports.

In order to smoothen implementation there will be regular interaction with other ministries and departments, industry representatives and implementing agencies for information dissemination related to impact of policy measures, promoting information dissemination on the application and use of ozone-friendly technologies.

A time and operational action plan will ensure compliance with the Montreal Protocol control schedules. The phase-out of CFCs in new products in all remaining enterprises of all sectors will limit CFC on a sustainable basis and provide the Government with the control and confidence needed to assure Iran's final compliance with the Montreal Protocol.

Even though it is the Iranian Government's intention to completely phase-out CFCs consumption by 01 January 2010, the ability of the Islamic Republic of Iran to comply with its obligations under the Montreal Protocol is done under the following assumptions:

- That all ongoing projects can be completed on schedule;
- That the full impact of projects completed in a particular year on the total levels of CFC consumption will not be realized until the following year;
- That illegal imports of any Annex A CFCs will be eliminated by the planned enforcement activities;
- MLF assistance will be available, as the impact on the economy cannot be borne by the society.

Given the size of the Islamic Republic of Iran and the huge inventory of installed CFC containing equipment, it will also be important to minimise the negative impact on the end users of CFC and owners of CFC containing equipment, while CFCs are phased-out.

The public awareness component has been designed to motivate a positive public opinion and support for the industry actions in production and servicing. Consumer satisfaction plays a crucial role for the industry and the government. The Government needs also to pay specific attention to disseminate the information concerning CFC phase-out at the end of 2009 and to provide timely advance notice to all end-users that they should take action, sooner rather than later, to eliminate their dependence on CFCs in all their operations.

All activities will be implemented with the assistance of altogether six bilateral and UN agencies, namely France, Germany, Japan, UNIDO, UNDP and UNEP. The projects will be grouped and assigned based on previous implementation experience of each agency. GTZ/Germany will be the lead-executing agency for the action plan and will be in close co-operation with other key agencies concerned, and with assistance from consultants.

Any unaccounted or unidentified eligible enterprises (except for MDI) will be identified and accommodated within the resources approved for this sector phase-out plan. The durations for the sub-projects will meet the annual performance targets as laid down in the operational planning of the NPP.

Although the remaining consumption of CFCs in the aerosol sector is for “essential” uses, there is a need to eliminate the remaining CFC consumption for MDIs. It is planned to assist those enterprises as soon as possible, when economic solutions are at hand and can be proposed to the MLF at a reasonable cost.

6 ACTION PLAN FOR THE INDUSTRIAL PRODUCTION AND SERVICING SECTOR

6.1 Introduction

The action plan for CFC users in the industrial production and servicing sector has been limited to the following industrial applications:

Sector	Application
Refrigeration	Use of CFC11 and 12 in manufacturing, assembly and servicing of refrigeration and airconditioning equipement.
Plastics/Foam	Use of CFC 11 in the manufacturing of various polyurethane foams
Electrical and Mechanical Engineering	Use of CFC 133 as solvent and cleaning agent in production and servicing of electrical and mechanical equipment

For ease of understanding the division in the following chapter has been applied based on the principal sector applications of CFCs for refrigeration, foam and solvents and respective sub sector applications. Each action plan is based on the principal elements such as support for investment, training, technical assistance, awareness creation, networking with stakeholder and associations and formulation of sector specific regulations. Based on the established needs the individual incremental costs are provided according to the definiton of the MLF guidelines.

The selection of technology in each chapter has been based on the principles

- Proven and reasonably mature technology
- Cost-effective conversion.
- Availability of the systems and raw materials.
- Critical properties that have to be obtained in the end product
- Compliance with established (local and international) standards on safety and environment.
- The technology selected needs to be appropriate for the size and level of selected enterprises.
- The selection of the technology needs to be consistent with the priorities of the Government and industry and to ensure sustainability of the technology in the long-term.

Technical assistance will be provided through international and where available, national experts. Their specific tasks include:

- Technical assistance for preparing specifications of equipment to be procured in the sub-project
- Technical equipment bid evaluation from suppliers during the competitive bidding process
- Technical guidance to the recipient enterprise during start-up with the new equipment and process, resolving technical issues with the phase-in of the new equipment and processes
- Technical evaluation of the results of production and product quality trials jointly with the recipient enterprise
- Technical project commissioning including final technical inspection of equipment and process and established completion and compliance. Verification of CFC stock elimination, and that the non-CFC production process is in operation and clearance of project completion
- Eventual technical certification of installations according to international standards and destruction of the baseline CFC-based equipment where applicable.
- Technical evaluation of enterprise reimbursement claims on equipment, raw materials, local works and other items and certification of the same
- Technical assistance for completion and other reporting requirements
- Trouble Shooting and help contact functions if problems occur after completion of the

projects.

Trials

- Trials will validate the new/retrofitted equipment as well as the production process using the new CFC-free technology and establish the performance and suitability in accordance with specifications and project objectives.
- Trials will be used to evaluate and establish satisfactory end product properties. Trial costs will cover the cost of chemicals, raw materials, components, consumables and utilities required during site preparation and commissioning.

Training

- Training forms an essential part of assistance. The training qualifies technicians and other personnel in production and service in proper and successful application of the new equipment and processes.
- Training will also address safety and industrial hygiene issues, such as flammability, ventilation, and health hazards and to institute the required industrial practices as applicable to the replacement technology.

Policy and Management Support

Specific management support will be provided in each individual sector:

- Prepare contributions to the annual implementation plans, structuring of consecutive sub sector conversions and selection of enterprises for participation in investment and training activities, onsite visits and preparation of individual or group proposals
- Evaluation of sector requests for support
- Coordination of planning and operations for training, invitation of participants, organisational support and financial assistance,
- Organisation of technical assistance according to demand, in form of on-site assistance, courses, workshops, meetings, etc.
- Assist overall NPP management, key government departments, legislators, and other institutional stakeholders in sector specific decision making
- Verification and certification of CFC phase-out in completed sub-projects within the Plan through plant visits and performance auditing.
- Develop and review sector specific regulation and legislation
- Maintenance and operation of a reporting system, e.g. number of beneficiaries of training, no. of CFCs/substitutes by users
- Reporting of implementation progress of the Plan for the annual performance-based disbursement.
- Establishment and operation of a decentralized mechanism for monitoring and evaluation of Plan outputs, in association with provincial regulatory environmental bodies for ensuring sustainability.
- Establishment of quality and performance standards for CFC-free products and applications within the sector.
- Follow up and organisation of certification and licensing needs in the refrigeration sector.

Awareness activities

- Organisation of start up activities, communication assistance for the implementation program
- Develop educational and promotional media such as posters, videos, brochures, manuals, etc
- Prepare and publish sensitising articles in newspapers
- Establish a network with chemical and equipment distributors for dissemination of information
- Organise awareness creation in the sector through workshops, media publicity and other information dissemination measures.
- Manage content of web sites, reference systems, bulletins and journals

- Coordinate meetings, gatherings public announcements with other sub sector and general NPP activities

6.2 Refrigeration Manufacturing and Assembly Sector Strategy

In the Islamic Republic of Iran, all manufacturing facilities for domestic refrigerators and freezers have been identified and many of those eligible have received MLF assistance for conversion projects. 67 projects are still ongoing that upon completion at the end of 2006 will phase out a total of 1,002.1 ODP tons of CFC. Another 92 eligible enterprises will phase out a total of 488.1 ODP tons of CFC with the help of MLF in the following years.

Remaining manufacturers and installers of new commercial refrigeration equipment and refrigerated transport equipment continue to use CFCs as the refrigerants, and some also consume CFC 11 in the production of PU foam for insulation. A number of ongoing and upcoming projects address most, but not all, of this continuing consumption.

All activities in the manufacturing sector will be summarized under a separate plan for elimination of CFCs in the Refrigeration Manufacturing sector in Iran, which will be updated after approval of the NPP and regulate the detailed combination of investment, technical support and Management Support components.

6.2.1 Sub-sector Strategies in Refrigeration Assembly and Manufacturing

Commercial Refrigeration Manufacturing

To date, the MLF has already approved 46 projects in the commercial refrigeration sector in the Islamic Republic of Iran. Many more enterprises have been identified as consuming CFCs in this sector and additional projects/assistance to phase-out remaining consumption of at least 275.4 ODP tons of CFCs are required. This would include 27 eligible enterprises.

Excluding 12 projects that were already completed, 33 ongoing projects that address part, but not all, of the consumption of CFCs in the commercial refrigeration manufacturing sector are expected to eliminate a total of 552 ODP tons of CFC consumption.

There are a remaining 27 eligible enterprises with a consumption of 274.4 ODP tons in the sector for which activities are proposed.

Domestic Refrigeration Manufacturing Sub-sector
All the manufacturers of domestic refrigerators and freezers in the Islamic Republic of Iran have been identified and MLF assistance for projects for conversion to non-CFC technology was obtained for those eligible for such assistance. A total of 22 projects remain ongoing. These projects are expected to eliminate the remaining CFC consumption in the domestic refrigeration manufacturing sub-sector of 347.6 ODP T until the end of 2006.

There are a remaining 7 eligible enterprises with a consumption of 107.3 ODP tons in the sector for which activities are proposed.

Domestic/commercial Refrigeration Manufacturing Sub-sector
To date, the MLF has already approved 9 projects in the domestic/commercial manufacturing refrigeration sector in the Islamic Republic of Iran. These ongoing projects are expected to eliminate a total of 119 ODP tons of CFC consumption.

Refrigeration Assembly Sub sector

There were no projects in the assembly sub-sector in the past. The proposal includes 58 companies that do predominantly assembly refrigeration with a total consumption of 105.5 ODP Tons.

MAC Manufacturing Sub-sector
CFC manufacturing of MAC equipment has been stopped in 1999 following a government initiative.

6.2.1.1 Investment Component for the Refrigeration Manufacturing and Assembly Sub-sector

The approach for implementing the investment component in the remaining eligible and unfunded enterprises in the sector is proposed to be through a combination of individual and group sub-projects as below:

For medium-sized enterprises

Individual sub-projects covering 22 enterprises (to be implemented by UNIDO)
Individual sub-projects covering 12 enterprises (to be implemented by UNDP)

For Micro enterprises/Assemblers

Two or three group sub-projects covering 58 enterprises (to be implemented by UNDP)

A list of all enterprises can be found in Annex III.

Most of the enterprises surveyed were physically visited through field trips and plant visits earned out by UNDP and by representatives from the Ozone Layer Protection Center during the year 2001 and were once again verified in 2003 following discussions with the MLF secretariat. This survey resulted in the inclusion of 92 enterprises that are consuming CFCs in the manufacture and assembly of commercial refrigeration equipment. This is not a complete list of enterprises, there may even be more enterprises consuming CFCs in this sector that remain to be identified.

This approach draws on previous implementation experience and has been designed based on the size, level of organization, location and customer base of enterprises concerned and also based on ease and convenience for execution and management. Given the generally small size of the remaining enterprises in the sector, with inadequate in-house technical capabilities, the need for adequate investments for plant and process changes, supported by investments on adequate technical assistance, trials and training, is critical and will involve proportionately larger inputs.

CFC phase-out in ineligible enterprises will not be funded and is expected to take place through the control, which the Government will have through advisory, policy and regulatory actions. Any unaccounted or unidentified eligible enterprises will be identified and accommodated within the resources approved for this sector phase-out plan.

6.2.1.2 Technology Selection

Foam Operations

New chemicals suitable for the selected alternative technology will be required. These will be available from existing chemical suppliers. No specific investments are foreseen for handling of raw chemicals. However, technical assistance will assist enterprises for safe handling of the chemicals.

The use of new formulations will lead to a marginal change in mixing ratios and increased viscosity leading to reduce flow ability of the chemical mixture. In case of rigid foam conversions, the HCFC-141b based foam will have an increased thermal conductivity in relation to that produced with CFC-11, which is being replaced.

The existing manual mixing process or low-pressure foam dispensers will not be able to handle the new formulations without adversely affecting the cell structure and thereby the thermal conductivity of the foam. Hand mixing is also not recommended from occupational health and safety standpoints. Therefore new high or medium-pressure foam dispensers as applicable, of equivalent effective capacity, which will provide a finer cell structure and help minimize the deterioration of thermal conductivity of the foam, and also minimize the occupational health and safety risks, will be needed to replace the existing dispensers/hand-mixing process.

The HCFC-141b based foam will have an increased moulded density with respect to the CFC-11 based foam, resulting in increased requirement of chemicals. This increase will be partially offset by the savings resulting from more efficient handling of chemicals due to the new foam dispensers.

Refrigerant Operation
Compressors suitable and optimised for HFC-134a/R-404a will be required. These will be available from existing suppliers. The chemical stability of HFC-134a/R-404a and of the synthetic lubricants compatible with HFC-134a/R-404a is highly sensitive to moisture and impurities in the system, as compared to that with CFC-12. The evacuation/charging process for HFC-134a/R-404a and polyester lubricant will need to ensure the required level of cleanliness and dryness in the system. To ensure this the following is proposed:

The vacuum pumps will need to be suitable for use with HFC134a/R-404a. Retrofitting of vacuum pumps has not proven feasible or cost-effective in the past due to several factors (unsatisfactory condition, inaccessible suppliers, unavailability of parts, production downtime, etc) therefore appropriate quantities of new vacuum pumps suitable for the conversion, consistent with the baseline capacities, will need to be provided.

The existing refrigerant charging units/kits are not suitable for use with HFC-134a/R-404a and cannot be retrofitted, and will therefore be replaced with automatic charging units or portable semi-automatic charging units suitable for HFC-134a/R-404a duty. The design/sizing of the refrigeration system will need to be suitably changed, to ensure the viability of the process and to maintain the product standards for performance and reliability, such as:

Reengineering evaporators and condensers, so as to ensure the levels of cleanliness and contamination that can be tolerated with HFC-134a/R-404a (< 5 ppm). Lengthening of the capillaries or changing the thermostatic expansion valve models. Use of filter-dryers with finer pores, suitable for use with HFC-134a/R-404a. The existing leak detection is unsuitable for detecting HFC-134a/R-404a leakages; therefore suitable hand-held leak detectors will need to be provided.

Conclusion
Based on the principles in chapter 6.1 and selection parameters for the technologies for foam and refrigerant operations described later on, the selection of the CFC replacement technologies in the remaining enterprises can be summarized as below:

Sub-sector	CFC Consumption (ODP T)	Technology Selected
Foam operation	316.9	HCFC-141b + partial water-based systems
Refrigerant operation	171.3	HFC-134a/R-404a

Table 6.1 Replacement technologies in the Refrigeration Manufacturing and assembly Sector

Foam Operation
The presently available/emerging CFC-phase-out technologies, for rigid polyurethane insulating foams are:

CLASSIFICATION	LIQUID TECHNOLOGY	GASEOUS TECHNOLOGY
Low ODP technologies	HCFC-141b, HCFC-141b + water	HCFCs (22, 142b, 22 + 142b/141b

(Interim)		
Zero ODP technologies (Permanent)	Water, Pentanes (n, iso, cyclo) HFC-245fa, HFC-365mfc, HFC-365/227	HFCs (134a, 152a)

Based on above principles for selection and technological, choices the enterprise will convert to CFC-free systems for their rigid polyurethane foam operations. Until the commercial introduction of mature CFC-free systems, HCFC-141b based systems will need to be used as an interim technology, to maintain product standards and acceptability.

Refrigerant Operation
The alternative technologies for replacement of CFC-12 in small capacity hermetic/semi-hermetic refrigeration systems are as below:

HCFCs:	HCFC-22, Blends
HFCs:	HFC-134a, HFC-152a
Hydrocarbons:	HC-290 (Propane), HC-600a (Isobutane), and HC290/600a (1:1 mixture of both)

HCFCs are not preferred long-term substitutes, due to their residual ODP.
Hydrocarbon technologies, though environmentally safe (no ODP/GWP or health hazards) and technically acceptable, require elaborate safety/monitoring provisions and investments due to their flammability and will not be suitable for cost-effective and financially sustainable transfer to small and medium-sized enterprises.

HFC-152a has higher discharge temperatures/pressures, is flammable and less stable at high temperatures and the technology for the same is not widely available.

HFC-134a technology as a replacement for CFC-12 based refrigeration systems, is universally accepted, especially in small hermetic/semi-hermetic systems. HFC-134a is a zero ODP option. The technology is commercially available. Hermetic compressors optimized for HFC-134a are commercially available. This technology is therefore the preferred conversion technology in this project. For low-temperature applications using R-502, based on similar lines as above, R-404a will be the selected replacement technology.

6.2.1.3 Refrigeration Technical Assistance Program (REFTAP) for Assemblers and Manufacturers

Technical assistance and Training will be required to be provided through international experts and, when available, national experts to ensure a smooth transition to the new replacement technology. The experts would need to be process specialists and their functions will include overall technical supervision of conversion projects and technical coordination between equipment/chemical suppliers, recipient enterprises and the implementing and/or executing agency.

Product and Process Trials
Trials will be required to validate the new/retrofitted equipment as well as the production process using the new technology, specifically to establish their performance and suitability for the conversion in accordance with specifications and project objectives. Trials will also be needed to evaluate and establish satisfactory end product properties. Trial costs will cover the cost of chemicals, raw materials, components, consumables and utilities required during site preparation and commissioning.

Application and Process Training
Training will be needed to acquaint the production personnel in the enterprise with the new equipment and processes. Training will also be required to address safety and industrial hygiene issues, such as flammability, ventilation, and health hazards and to institute the required industrial practices as applicable to the replacement technology.

Refrigeration Assembly training
The assembly of refrigeration equipment for commercial application with prefabricated parts is a common practice in Iran. Those enterprises get contracted to assemble a combination of prefabricated parts, install them on site and charge the refrigerant. Some of these enterprises assemble parts from various suppliers or they simply assemble and install parts from one supplier.

A large group of enterprises involves in the assembly, installation and charging of refrigeration equipment. This subgroup has been identified during the most recent surveys in the refrigeration sector. Historically the NOU had registered only enterprises engaged in pure refrigeration manufacturing activities, excluding those who are doing assembly. These enterprises need special assistance in redesigning their products and systems. They need training in charging and handling new refrigerants and the use of new equipment.

In order to assess the funding requirements of these groups, the incremental costs have been applied as advised under Excom decisions 31/61, 31/31/45 and 31/54.

Technical Support Component for the sector
Given the generally small size of the remaining enterprises in the sector, with inadequate in-house technical capabilities, the need for adequate investments for plant and process changes, supported by investments on adequate technical assistance, trials and training, is critical and will involve proportionately larger inputs. Since the Sector Phase-out Plan will address the entire Refrigeration (Assembly and Manufacturing) Sector, the industry as a whole will need to be supported through provision of a technical support component for ensuring that phase-out actions and initiatives are not only technically sound but also sustainable, and consistent with the important priorities of the Government, which are to prevent industrial dislocation and obsolescence. The Technical Support component will assist predominantly the Refrigeration Assembly enterprises, but also the sector as a whole.

The Phase-out in the refrigeration (Manufacturing and Assembly) will be managed by a coordinator to be designated by the Government and supported by representatives and experts from the implementing/executing agencies and the necessary support infrastructure.

6.2.1.4 Incremental costs and impact of the refrigeration manufacturing and assembly sector activities

The incremental capital and operating costs for the refrigeration manufacturing and assembly sector are calculated based on the guidance provided by the various Executive Committee Decisions and precedents and agreements reached with MLF during recently approved similar projects in this Sector. The basis and detailed calculations for the various cost elements are presented in Annex IV. The total costs worked out are as below:

Cost Head and Enterprise Type	Medium enterprise Manufacturers	Small enterprise Manufacturers	MSE Assemblers
Investment Component			
Foam Operation			
Foam dispenser	60,000	25,000	0
Trials	2,000	2,000	0
Technical assistance	2,000	2,000	0
Training	1,000	1,000	0
Sub-total (Foam)	**65,000**	**30,000**	**0**
Refrigerant Operation			

Charging units	4,000	2,000	4,000
Vacuum pumps	5,000	2,500	5,000
Leak detectors	1,000	500	1,000
Trials	1,500	1,500	1,500
Sub-total (Refrigeration)	**11,500**	**6,500**	**11,500**
Sub total per enterprise	**76,500**	**36,500**	**11,500**
Number of enterprises	22	12	58
Sub total all enterprises	**1,683,000**	**438,000**	**667,000**
Total	**2,788,000**		
Training, Technical assistance and support (REFTAP)	**409,100**		
Program Start Up Costs	**78,000**		
Grand Total	**3,275,100**		

*only for machine installation
**only for machine operation
covered by the Refrigeration Technical Assistance Program (REFTAP)

Table 6.2 Overview Total Cost Refrigeration manufacturing and assembly sector

The incremental costs of the Plan are budgeted under adoption of cost-effective execution strategies and positively applying projected dynamics of the market, while providing the Government with the flexibility and the resources to align its policy and regulatory actions.

Investment requests have been reduced to the minimum and been replaced by intensified, more cost effective technical assistance, trials and training. Only those enterprises with significant or meaningful foaming baselines have been considered for supporting the foaming operations. The proposals for replacing the baseline CFC-based equipment have been based on functionality rather than eligibility alone, resulting in savings in the overall costs of the replacement equipment, in accordance with prior agreements with MLF on similar projects.

To account for the impact of market forces in shaping the incremental operating costs, projected price differentials are considered only for foam chemicals and refrigerants (and not for other components).

It can be assumed that the cost for conversion of the proposed enterprises will be higher in comparison to earlier approved projects. Nevertheless, the historical cost effectiveness ratio in the sector has been applied for calculation of the fundable consumption. The amount of the CFC that is consumed in excess of the fundable consumption in the sector will be accommodated within the resources approved for this sector phase-out plan.

6.2.1.5 Implementation of the refrigeration assembly and manufacturing sector activities

Implementation of the project for phasing-out CFC consumption of the remaining enterprises in the Domestic and Commercial sector will be done by UNDP, UNIDO. The projects will be grouped and assigned to each agency based on previous implementation experience of each agency and also on the basis of size, level of organization, location and customer base of enterprises concerned. Any unaccounted or unidentified eligible enterprises will be identified and accommodated within the resources approved for this sector phase-out plan.

6.2.2 The Refrigeration Servicing Sub-Sector Strategy

The Islamic Republic of Iran is using approximately 475 tons of CFC to service refrigeration and air-conditioning equipment. Out of this volume approximately more than 85 % is vented into the atmosphere due to bad service practices and lacking equipment. Since there is no operational recovery and recycling scheme for technicians, the used refrigerant from the equipment is also vented into the atmosphere. The volume of the used refrigerant wasted is estimated at 405 tons. In case the service operators would have proper equipment for recovery and recycling about 315 tons of this wasted old refrigerant could be saved and re-used. The use of recycled CFC would provide an alternative source from importer virgin CFC. It can be expected that by securing this volume CFC refrigerant, the country's demand for imports of CFC will be reduced.

The Refrigerant Management Plan was already proposed by UNIDO to the 38th meeting of the MF and is integrated into the NPP. It aims at developing a comprehensive and detailed program to phase-out a maximum tonnage of CFCs used for servicing refrigeration and air-conditioning equipment in Iran. This Refrigerant Management Plan consists of the three following components, which are included in the NPP:

- Training program on good practices in refrigeration and air-conditioning maintenance
- Recovery and recycling of refrigerants
- Training of customs officers on control of ODS and ODS containing equipment imports

The total costs of the implementation of the Refrigerant Management Plan are estimated at US$ 2,375,000 and the overall cost effectiveness of the three components is 5 US$ /kg of ODP phased-out.

6.2.3 Training for Good Practices in Refrigeration

This activity will provide technical information and training to service, maintenance and repair personnel in the refrigeration sector in order to reduce ODS consumption during the servicing of refrigeration and air-conditioning units. In order to reach the objectives as identified in the country program and Refrigerant Management Plan. Professional training for hands-on service, maintenance and repair personnel are essential. The servicing of refrigeration equipment accounts for approximately 475 ODP tons of CFC 12.

The project aims at containing and reducing ODS usage in the refrigeration and air conditioning sector by:

- increasing participation and awareness of ozone depletion issues
- providing information on conservation techniques and on new ozone friendly refrigerants
- introduction and demonstration of procedures that eliminate refrigerant emissions during preventive or unscheduled maintenance selection and guidance in use of retro filling refrigerants such as HFC-134 A, where applicable
- development of a network for information sharing throughout the sector

This project is being proposed to train refrigeration technicians in the country in the proper methods of performing repairs, maintenance and installation of refrigeration and air conditioning equipment to avoid leaks and unnecessary emissions of CFCs. The aim of the project is to improve service and maintenance practices in order to prevent intentional and/or unintentional releases of ODS into the atmosphere, making it possible for refrigeration equipment to operate to the end of its useful life. The proper and effective recovery will be strongly highlighted since the recovered refrigerants are necessarily a very important source of refrigerants in the future. Training is also needed to support the implementation of the envisioned and rather strict ODS regime.

Even though the conversion of the existing larger refrigeration systems might not present an essential option in the phase-out, the key technical issues related to the conversion will be taught in the training; the characteristics of CFC and non CFC equipment and the main factors to be taken into consideration.

The training will promote use of good refrigeration service and maintenance practices for systems using ozone-friendly substances, and the correct handling of new replacement refrigerants. This

project will be co-ordinate with the Recovery and Recycling project being proposed along with the Government's Refrigerant Management Plan.

It's expected that the following results will be obtained by this project:

- Reduction of ODS consumption due to leaks and poor practices
- Reduction of ODS consumption by enhancing the introduction of alternative substances and non-ODS equipment.
- Training of approximately 6,600 technicians, on good practices, and inclusion of such training as a permanent part of the curriculum of the vocational training centers.
- Reduction in the number of repairs of refrigeration equipment and consequently a reduction in CFC releases into the atmosphere.
- Improved maintenance and servicing practices in the refrigeration sector.
- Improved regulatory framework and licensing for the refrigeration maintenance sector, which will enforce good maintenance and servicing practices, as well as the recovery of refrigerants.

It is expected that the trained technicians themselves, and after being qualified in their skills further in the businesses, will save approximately 405 tons of the estimated 475 tons of CFC, which is currently vented into the atmosphere. The potential saved quantity of CFC is estimated as follows:
Approximately 1,600,000 domestic units are maintained annually (8% of the total domestic refrigerators in the country) using in average 250 gr. of CFC per operation. The average charge is 250 gr. per unit. Good practices will reduce all the leaks resulting in saving of 150 gr. per unit, i.e. 240 tons P.A.

Commercial units are maintained regularly but with poor standard. A very clear trend is also the quick replacement of ODS containing units by non-ODS units. Use of recycled refrigerants is easier for commercial units than e.g. for domestic units. It can be estimated that the good maintenance practices will reduce a minimum of 40 tons of ODS, resulting 500 grams per unit emitted to the atmosphere, using average 1,000 grams per unit for charging approximately 80,000 commercial refrigerator units (20% of total 400,000 commercial refrigerator units in the country).

All industrial/large cold store units (about 1500 units) are recharged twice a year. It is estimates that each recharge operation is wasting 30% of the refrigerant used (average charge per unit 100 Kg.), i.e. one 85% is charged to the equipment and the remaining 30% vented into the atmosphere. This means that the refrigerant consumption can be reduced from 150 tons to 100 tons p.a. and 50 tons could be recovered.

When the training is finalized and basic recovery equipment is on place, a minimum of 25 tons of CFC-12 used due to leaks and poor practices in the other servicing sectors will be saved.
It must be mentioned that the newer equipment supports the phase-out, which use less refrigerants and are more and more ODS-free.

To be successful a deep commitment from the participating companies is needed. The impact of the training will be supported by a certification system. The Institutional strengthening program will develop a scheme according to which the issuance of new, and extension or renewal of old workshops' commercial licenses will be refused unless there is at least one trained technician among the staff.

With most of the companies in the refrigeration service sector involved in the service of both domestic and commercial refrigeration equipment, 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 and MAC sectors have sufficiently different issues to warrant being treated separately.

The total cost of this training program project is US$ 1,078,608.

6.2.4 Recovery and Recycling for Refrigeration Servicing

This project will provide approximately 10,000 thousand small workshops with the basic tools needed in recovering the used refrigerant. Currently all used refrigerants are vented into the atmosphere. The first action is under implementation. Training of the technicians is scheduled to start during the first half of 2002. After the training is initiated and distribution of the recovery and recycling equipment to the maintenance companies to be run by trained technicians can be started. The information needed to prepare this project was supported by a survey conducted by local consultant company, by the National Ozone Unit and national consultant appointed by UNIDO.

The implementation of the National Recovery and Recycling project in the refrigeration sector will help prevent venting CFC-12 into the atmosphere during maintenance, decommissioning or retrofitting operations.

The volume of the used refrigerant wasted is estimated at 405 tons. In case the service operators would have proper equipment for recovery and recycling about 315 tons of this wasted old refrigerant could be saved and re-used. The use of recycled CFC will provide an alternative source from importer virgin CFC. It is expected that by securing this volume CFC refrigerant, the country's demand for imports of CFC will be reduced

The recovered refrigerant, when purified to an acceptable technical standard is recycled to keep running old CFC-based equipment until the end of its technical or economical life. The use of recycled CFC-12 will provide an alternative source of refrigerant, it is therefore expected that the country’s imports of CFC-12 will decrease.

The project aims at supplying approximately 6,600 service companies with basic recovery equipment (vacuum pumps) recovery cylinders and necessary tools. A further 52 recycling centers will be established in appropriate geographical locations, close to main areas of high CFC usage.
The following are results expected from this program:

Category I Refrigerant Consumption > 1,500	Category II Refrigerant Consumption >1000	Category III Refrigerant Consumption > 500	Category IV Refrigerant Consumption >150	Category V Refrigerant Consumption >70	Category V I Refrigerant Consumption > 30
25	35	800	3,000	2,800	3,340

Table 6.3 Number of Repair and Service Workshops, Year 2001

The numbers in the table above were revised in accordance with official written information received from the Association of Iran Refrigeration Service Shops that have about 10,000 members throughout Iran.

Approximately 800 of the largest service workshops and companies, which consume more than 500 kg CFC per year, will receive recovery machines and associated equipment and tools such as vacuum pumps equipment kits. The 2,800 workshops are small service workshops which consume up to 150 kg/year CFC in total will be provided with maintenance and associate equipment kits/or portable recovery and charger device and recovery bags and associated recovery cylinders, 3000 small service workshops will receive recovery bag and 30 lb. DOT Recovery Cylinder. It is also reasonable to provide them with basic equipment and tools. Approximately 6,000 large, medium and small service workshops technicians out of 25,000 technicians will receive necessary skill training.

The conditionals for participation will be; at least one technician certified by the training program and a signed commitment to recover a determined quantity of refrigerant per year, based on current consumption volumes. 15 demonstration workshops (lasting 3 days each) will be held for the attention of all firms, small shops, and technicians operating in the refrigeration and air conditioning sector at Training Center of 15 selected Areas. An international consultant and a representative of equipment

supplier will introduce and explain the recovery recycling program and infrastructure; hands-on demonstration will be organized.

The National Ozone Office will keep records of the amounts of refrigerant recovered; the quantities of recycled refrigerant stored at their recycling centres and monitor the quality and the price of recycled CFCs.

The total cost of this CFC 12 recovery project is US$ 1,673,800
Details of the project are appended as ANNEX IX.

6.2.5 Costs and Impact of activities in the domestic and commercial refrigeration servicing sector

This project aims at providing 6,600 service shops of total 10,000 personnel, with basic recovery equipment (vacuum pump, recovery cylinders, leak detectors) and training and establishing 52 recycling centres geographically distributed across I.R. Iran.

The estimated phase-out of fundable CFC consumption is 405 ODP (85% of total 475 tons of CFC12 used in service sector) tons of CFC recovered and re-used to service existing CFC based equipment.

The following table summarizes the costs of actions;

Component	**Objectives**	**Total Costs US$**
Training for good practices in refrigeration	Training of 6600 shop floor technicians	472,000
Recovery and Recycling of refrigerants and monitoring	Procurement of recovery and recycling equipment	1,673,800
Training of the customs officers	Monitoring of imports and exports, support to regulatory actions	229,200
Total		**2,375,000**

Table 6.4 Overview total costs RMP

It is expected that the CFC 12 consumption for maintenance purposes will stabilize at the current 475 tons. The timing and estimated impact of the implementation of the refrigerant management plan and its components are indicated in the following table:

Component	**Estimated phase out of fundable ODP Tonnes (by end of year)**						
Year	2003	2004	2005	2006	2007	2008	2009
Training for good practices Training of customs officers		40	75	104	122	129.5	134.5
Recovery and Recycling		80	150	209	245	260	270
Equipment retirement discounting		9.5	20.0	31.4	44.1	58.0	70.5
Total impact tons of ODP		**129.5**	**245.0**	**344.4**	**411.1**	**447.5**	**475.0**
Net phase out per year		129.5	115.5	99.5	66.6	36.4	27.5
Remaining CFC demand for service by end of year	475	345.5	230	130.6	63.9	27.5	0

Table 6.5 Impact of domestic and commercial servicing activities on fundable CFC consumption

When implemented the three proposed activities will result in phase-out of 405 ODS tons leaving out a volume of 475 tons, which is needed for service purposes in 2003 and beyond. It is expected that

this service tail will be phased out by the end of 2010 by implementing regulatory measures and through scrapping old CFC consuming domestic commercial and industrial equipment.

6.3 The MAC Servicing Sub-sector

Consistent with the recommendation of the Parties to the Montreal Protocol, one of the policies to be implemented is requiring the use of recovery/recycling equipment when servicing CFCs based MAC systems. The MAC project would also include training/certification of participating service shops/technicians, reporting/monitoring system by NOU, TA for awareness program and strengthened import controls to ensure that CFC-12-based MAC units or CFC-based MAC components do not enter the country. The project would also be designed to receive recycled CFC-12 from either any local recovery program from commercial refrigeration/chiller systems or from imports.

As stated before there are 917 MAC service shops employing about 2,000 technicians and workers, which consumed an estimated 575 ODP tons CFC-12 in 2003. About seven percent of the annual reductions (based on a lifetime of min. 10 to max. 20 years for vehicles) are expected to come from natural causes, such as retirement of MAC units due to age, and other factors such as accidents or excessive maintenance requirements. The balance of annual reductions starting from 2005 on is expected to come from increased use of recycling and incentives to apply drop-ins and retrofit under the proposed project. In the later years and from 2010 onwards, the recycling machines are expected to continue operation, based on recycled CFCs and would assist in minimizing early retirement of MAC systems and enable I.R. of Iran to achieve zero CFC consumption by end of 2009.

The consumption in the remaining workshops will be phased out based on the experiences of the pilot MAC project, which has shown that apart from recovery and recycling, training in best practices such as retrofit, drop-in and hermetisation techniques are very effective and at least as important.

However, part of the CFC consumption will be phased out through final retirement of equipment. The following scenario has been developed under consideration of various factors, including natural retirement, R&R and effectiveness of training best practices.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Phase Out by retirement	6.4	7.7	9.2	11.1	13.3	15.9	19.1	22.9	27.5	33.0	39.6	47.6	57.1	68.5	82.2	98.6

Table 6.6 Phase Out of CFC from natural retirement of MAC systems

The depreciation of retired vehicles is based on the average production growth for 15 years, discounted from 1999 on downwards.

The table below shows the CFC demand development if only R&R is used as a reduction measure:

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Consumption w/o NPP*	**617**	**609**	**600**	**589**	**575**	**560**	**540**	**517**	**490**	**457**	**417**	**370**	**313**	**244**	**162**	**63**
Recovered from working						44.8	86.5	124.2	141.1	146.2	133.5	118.3	100.0	78.1	51.8	20.3
Recovered from scrap vehicles						3.2	7.6	13.8	19.8	26.4	31.7	38.1	45.7	54.8	65.8	78.9
Implementation ratio						0.3	0.5	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Demand for new CFC	**617**	**609**	**600**	**589**	**575**	**512**	**446**	**380**	**329**	**284**	**252**	**213**	**167**	**111**	**44**	**(36)**
Total annual reduction						47.9	94.1	138.0	160.9	172.6	165.2	156.4	145.7	132.9	117.6	99.2

* including annual discount of retired equipment

Table 6.7 Phase Out scenario for R&R activities in the MAC sector

The table below illustrates the effectiveness of R&R combined with a training **and** incentive program:

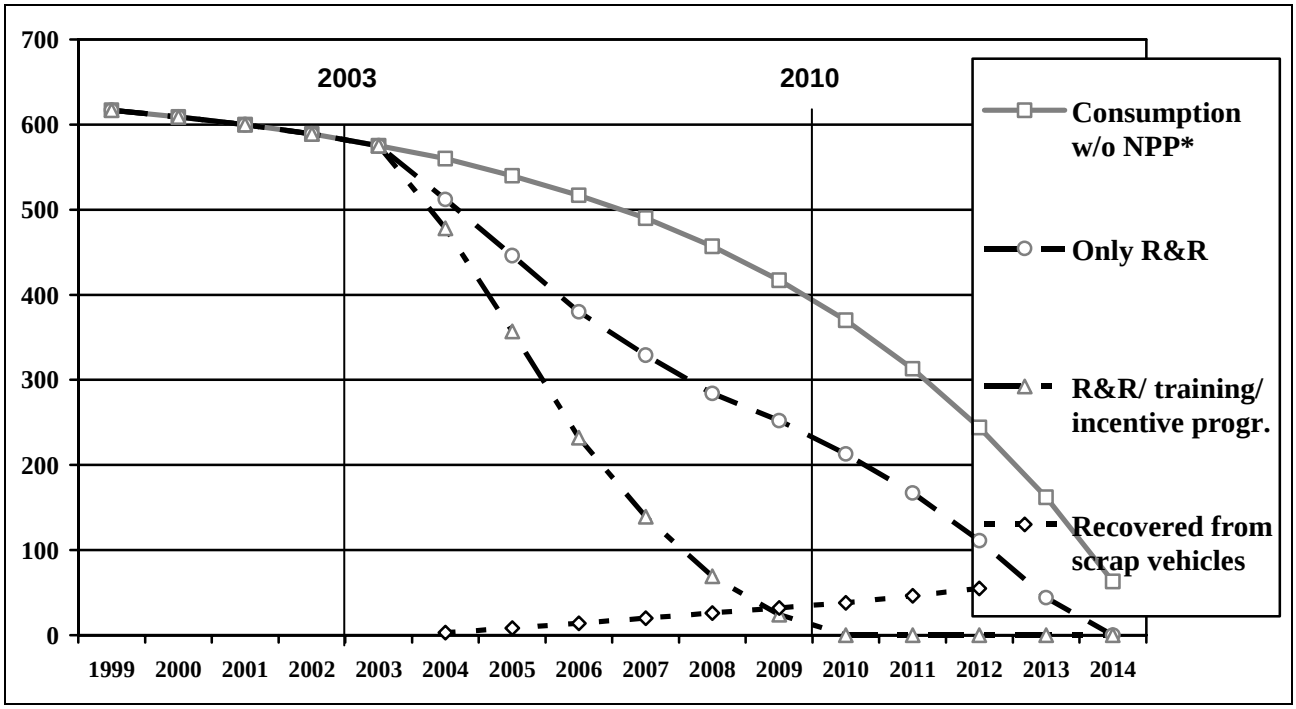
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Comsumption W/o NPP*	**617**	**609**	**600**	**589**	**575**	**560**	**540**	**517**	**490**	**457**	**417**	**370**	**313**	**244**	**162**	**63**
Reductions from drop-in, retrofit, hermetisation,etc						33.6	60.8	76.2	69.0	52.2	30.1	11.5				
Adjusted consumption w/replacements						**560**	**507**	**423**	**319**	**217**	**126**	**48**	**0**	**0**	**0**	**0**
Adjusted recovered from working vehicles						44.8	81.1	101.5	92.0	69.6	40.2	15.3	-6.6	-27.0	-46.8	-67.1
Recovered from scrap vehicles						3.2	7.6	13.8	19.8	26.4	31.7	38.1	45.7	54.8	65.8	78.9
Demand for new CFC	**617**	**609**	**600**	**589**	**575**	**478**	**357**	**232**	**139**	**69**	**24**	**0**	**0**	**0**	**0**	**0**
Total annual reduction						81.5	183.1	285.8	351.3	387.7	393.7	386.7	367.4	336.0	292.0	234.5

* including annual discount of retired equipment

Table 6.8 Proposed overall annual consumption and reduction scenario in the MAC sector

The table indicates that only with intensive training and qualification measures in the sector the consumption can be brought down to 0 consumption of new CFCs in 2010. Eventually remaining demands for CFC could be completely covered by existing stockpiles of recovered CFCs.

The following graph illustrates the impact of the said above. It clearly indicates the compliance in 2010 can only be achieved if all possible means of reduction are be applied.



*including retirement of equipment

Figure 6.1 MAC consumption and reduction scenario 1999 to 2014

Since actually bus, large and medium size automobile service shops are dealing with CFC-12 for recovery and recycling, it is feasible to equip these workshops with suitable recovery recycling, and charging machines. MLF assistance is requested to implement the following proposed strategy for the MAC service sector:

- Recovery & Recycling of CFC 12 in the major MAC Service & Repair Activities (Equipment to be provided to selected MAC Service Centres after mechanics have completed the training course).
- Remove all possible source of refrigerant leakage/loss during storage, handling, charging, operation
- Whenever Possible, Recycled CFC 12 to be used for All Re-charge and "Topping-up" of CFC 12 based MAC Systems.
- Whenever Possible, Replacement of CFC 12 MAC Systems, Replace with HFC 134a MAC Systems.
- Source Additional Recycled CFC 12 Requirements only from Approved Regional Recycling or Reclaim Centres.

6.3.1 Investment Component for the MAC Servicing sector

In MAC servicing, there is no need for the establishment of reclaim centers, because MAC equipment is less sensitive to the quality of recycled CFCs. Therefore, it is proposed to equip all enterprises with R&R equipment, which allows the recycling of refrigerants in the workshop. Thus, the probability of R&R use in the workshop is very high, because the application of R&R procedure in the workshop does not interfere with the existing workflow and offers economic incentives to use recycled material. Experiences from other countries show that R&R can be sustained as common practice throughout the sector, with a high degree of recovering remaining charges of MAC systems.

Because of the differences in size of enterprises, two sets of equipment are proposed. First of all, it is important to observe the evacuation requirements of the workshops and avoid the use of uneconomic, low capacity equipment, which generally leads to complete failure of such projects. The following tables provide cost summary of the investment costs proposed.

1. Set: A total of 388 Medium Automobile service shops will be equipped with:

Item	Qty	Single cost	Total cost
Trolley type Recovery, Recycling, and Charging machine, vacuum pump, suitable for CFC-12, oil free compressor.	388	3,000	1,164,000
Recycling cylinders two valves	776	65	50,440
Portable Leak detector.	388	300	116,400
Sets of spare parts (consumables, filters and fast wear items, high vacuum pump oil, recovery compressor oil)	388	500	194,000
			1,524,840

Table 6.9 Costs MAC R&R equipment for medium size workshops

2. Set: A total of 54 Bus/Truck/Train/Ships service shops will be equipped with:

Item	Qty	Single cost	Total cost
Big Recovery, Recycling, and Charging machine with capacity of minimum 400 gram/min. suitable for CFC-12.	54	10,000	540,000
High capacity Vacuum pumps, minimum 18 Cubic meter/hour	37	350	12,950
Recycling cylinder two valve 12 kg	74	65	4,810
Recycling storage tank 1 t	74	3,000	222,000
Portable Leak detector.	37	300	11,100
Portable refrigerant analyser	37	1,500	55,500
Forklift with build in scale	37	2,600	96,200
Sets of spare parts (consumables, filters and fast wear items, 10 Liters of high vacuum pump oil, 1 liter recovery compressor oil	37	500	18,500
Total			961,060

Table 6.10 Costs R&R equipment for large size workshops

6.3.2 MAC Sector Training and Incentive Program

The core element of the MAC Training and Incentive Program (MACTIP) is the training and incentive component for local workshops to build up their capacity in "best practices" in MAC maintenance and repair and successfully promote retrofit, drop in and replacement of CFC in cars vehicles. Most importantly the know-how in CFC management and conservation need to be trained to upgrade and intensify the economy of servicing, thus compensating increased cots of and giving incentive for CFC conservation and replacement techniques. The training will help to control and reduce the release and use of CFCs for maintenance and service in the domestic and commercial refrigeration sector through actions to:

- Establish best practices for better hermetisation, leakage detection and control measures;
- Establish procedures for CFC conservation including, recovery, recycling;
- Create an incentive pay back system for recycled CFCs and CFC replacement measures
- Reduce and eliminate partly all unnecessary consumption and waste in the management, storage and containment of CFCs;
- Prevent wherever possible premature equipment retirement caused by non-availability of CFC12;
- Establish knowledge and technical know-how in best practices in the application of drop-in refrigerants and retrofit in the country;
- Contribute to efforts to reduce climate change by encouraging greater energy efficiency through better quality service;
- Secure job opportunities in the MAC sector through provision of proper knowledge on CFC conservation and replacement, thus avoiding dramatic negative economic impact on the income situation of workers in the sector and maintaining a trained labour force for the country.

The training targets technicians that are already working in the sector as well as trainers for refrigeration technicians in the Vocational Training Centres (VTC) and industry, those being used as multipliers for the training.

A network of institutions and private sector organisations will be established throughout the country. Trainers will be trained in a train the trainer course and prepared for the task. They will provide the training for which their institutions will be reimbursed.

Through a network of workshops and chemical suppliers, the drop-in and retrofit technologies will be promoted among vehicle owners. Suppliers and workshops will offer special incentives for conversion as a pre-investment. In return they will benefit from the educational elements of the MACTIP. The establishment of better practices together with massive promotional and networking activities will be the key for a self-sustained process of CFC replacement in the sector. Customers will be aware of the benefits from tighter systems, better service and long lasting refrigerants. Participants of the national qualification program and the machine program will pay back training, machinery and tools with certified CFC replacements of customers and recovered CFCs, and will benefit from increased business and being promoted as certified technicians through the program.

The technicians training will be decentral and will be conducted with the help of mobile units. These mobile units will be attached to a truck. Altogether two mobile and two stationary demo units will be disseminated to regional training partners. Wherever possible, training will be conducted in existing vocational schools. A more detailed description and list of training items can be found in the Annex XI.

Individual costs for training and start up costs can be found in the Annex XI . The total costs for the for the training, awareness and start up program in the sector are as follows:

Calculation Basics	
Mechanics active in MAC	2,000
Mechanics excluded (will be trained under the RMP activities)	690
Course Participation rate of eligible workshops	0.655
Total Trained	1,310
Ave. Participants/course	12
Total amount of courses	110
Amount of courses/week	1.3
Weeks/year	25

Table 6.11 Calculation Basics of the training program

Cost Summary MACTIP			
Cost Item	Units	Cost per Item	Total
International expert(2 workshóps)	2	20,450	40,900
Train the Trainers activity	25	2,580	64,500
Technician training courses	110	1,458	160,380
Training equipment (Mobile Demo Units)			267,456
Promotional start up/workshop			226,000
Monitoring			145,000
Basic Tool set mechanics	917	156	143,052
Contingencies	0.1		41,051
Requested grant			**1,088,339**

Table 6.12 Costs overview MAC Training and Technical assistance program

6.3.3 Costs of the MAC Component

The total costs of the component (excluding agency support costs) will be 3,545,719 US $. The project will be implemented by end of 2009.

Item	**US $**
R&R Investment Component	
Large Size Service workshops	961,060
Medium Size Service workshops	1,524,840
Training/TA component MACTIP	1,088,339
Total	**3,574,239**

Table 6.13 Costs overview MAC sector

6.3.4 Impact of the MAC component

Based on experience from other projects the total impact of the project is calculated on the outreach of activities after implementation of the project and on the estimated impact of the various measures. The baseline consumption applied in the calculation is 575 ODP T for 2003 (s. table 6.8)

Best practices	**Outreach**	**Impact**	**Amount ODP T**
Hermetisation	0.8	0.1	46
Retrofit	0.8	0.1	46

Drop-In	0.8	0.1	46
R&R	0.8	0.4	184
Recovery from scrap vehicles	0.8	0.05	23
Total			345

Table 6.14 Impact of MAC components (2003 Baseline)

The impact of the MAC component needs to differientiated between the overall impact and the impact on fundable consumption. While the overall impact is based on the estimate of total consumption, the reduction of fundable consumption is based on the assumption that customs training and enforcement activities will lead to a situation where in 2010 at least 90 % of the of the consumption in the sector will be from eligible, reported consumption.

The fundable phase out will accumulate to 326 ODP tons by end of 2009. The total phase out is estimated to be higher, after deducting the equipement retirement rate of 7,5 % on average per year, it will settle at 348 ODP T of achieved phase out by 2010. Based on the average lifetime, all CFC based MAC systems are expected to be retired by the end of 2015, however this depend largely on the individual maintenace of vehicles.

ITEM	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Total Phase Out	78.3	175.5	272.1	331.5	361.3	362.0	348.6
of this fundable consumption	45.6	115.8	195.9	258.6	303.5	326.0	0.0
Net annual increase in fundable phase out targets	45.6	70.2	80.1	62.7	44.9	22.5	0.0

Table 6.15 Net annual fundable phase out targets

6.3.5 Regulatory component for MAC service

The government will draw up regulations for which MAC applications CFC replacement will be required until 2009. The recovery of CFC from scrapped cars will be obligatory and needs to be certified by an authorised workshop with trained personnel and recovery equipment. The regulation will be designed in such way that eventually remaining applications after 2009 can be covered by the stock pilings of recovered CFCs from scrapped cars. After implementation of the R&R program, recovery of CFCs will be obligatory in every service.

6.4 The Foam Sector

The foam sector phase out strategy has been established based on the historical development and the present structure of the foam industry in Iran, including the present status of ODS phase out, as well as forecasts of production and consumption of CFCs and their substitutes, with the objective of developing and implementing the most efficient and cost-effective phase out program possible.

The foam sector is a rapidly growing sector, and it is very important that the strategy is designed to minimize any adverse impact on its development. As the PU foam sector was the only sector were companies responded use of CFCs, this strategy only addresses the PU foam sector (PU Rigid foam, PU Flexible foam and Integral skin foam), and is limited in terms of its funding application, action plan and operational mechanism to the phase out of remaining CFC-11 consumption as a foaming agent in the PU foam sector. All enterprises working in polystyrene foam and shoe sole fabrication denied any use of CFCs.

The Government plans to phase out the remaining consumption 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 funding of US$ 5,386,046 from the MLF. The funding level is calculated based on the

remaining ODP tons allocated to the foam sub-sectors and the foam sub-sector cost-effectiveness thresholds. Through a national survey a total number of 33 foam companies were identified to be eligible.

Methodology of data collection and verification:

- Customs and commerce departments
- Importers/distributors of raw materials
- Information of machinery suppliers
- Information from manufacturers
- On site visits
- Cross-referencing records of the MF, IAs and the NOU
- Verification of reports and documentation on CFC consumption through the NOU

Companies with an established consumption of CFC were contacted through interviewers through site inspections or telephone if not otherwise possible. The interviewers verified data through bills and stocks on CFC and raw materials.

Eventual remaining eligible companies with very small consumption can still benefit from a Technical assistance program. The technical assistance program entitles every eligible foaming company to request technical assistance in foaming, formulation, safety installations and foam testing.

The objectives of the phase out strategy are to achieve the following:

- Provide incentives for enterprises to phase out CFC-11 and adopt environmentally sound substitute technologies;
- Ensure the phase out target of CFC-11 consumption in the foam sector is achieved according to schedule;
- Encourage the promotion of technically suitable substitutes to replace CFC-11 based blowing agents and invest in long-term solutions;
- Ensure that factors of phase out targets that could affect the growth of the foam sector are reduced to the minimum.

6.4.1 Investment Components of the Foam Sector

6.4.1.1 Rigid Foam Producers

The total installed production capacity for rigid PU-foams manufacturers is about 20,000 cubic meters per year, the actual production level at present is approximately 15,000 cubic meters per year. The manufacturers expect this market to grow by about five to ten percent per annum.

Sector	Num-ber	Products	Combined CFC –Consumption (t/y)	Replacement Technologies
Rigid Foam	11	Sandwhich Panels, Insulation Panels,Doors,	218.9	Pentane, WB, 141 B

Table 6.16 Remaining fundable enterprises in the rigid foam sector

Rigid foam is produced by companies of various sizes spread all over Iran. 5 enterprises have so far been funded by the MLF. The main products include panels and refrigeration equipment, cold storage, construction insulation and doors for various purposes. However there are others also applying rigid and semi-rigid foaming for automotive (e.g. shock absorbing) parts, spray insulation and packing materials. The various products set specific requirements for the foaming equipment. In general, low-pressure equipment can be used for products without no insulation performance requirements. High-pressure equipment must be used for products where insulation performance is essential.

The replacement technologies selected by Iran are Pentane (N-Pentane) and water-based systems with HCFC-141b as an intermediate application. Among all the identified enterprises, the larger size enterprises will select Pentane technology and the rest will select water-based/HCFC-141b technology.

The incremental capital costs for Pentane technology for rigid insulation panel & cabinet insulation per enterprise are based on the following costs:

Equipment cost	US$ 321,000
Trials and training	US$ 16,000
Technology transfer	US$ 10,000
Total per enterprise	US $ 347,000

Table 6.17 Capital costs for Pentane installations in the rigid foam sector

The incremental capital costs for water-based/141-B technology for rigid foam per enterprise are based on the following costs:

Equipment cost	US$ 65,000
Trials and training	US$ 15,000
Technology transfer	--
Total per enterprise	US $ 80,000

Table 6.18 Capital costs for water-based installations in the rigid foam sector

The total incremental costs only for required equipment (see also ANNEX XIII table XIII.2) for all enterprises would amount to US $ 2,177,00 for all 11 enterprises. The investment will lead to a phase out of 218.9 ODP T which would be equal to a cost efficiency of 9.9 US $ per kg ODP. However, because of the high cost effectiveness of converting these smaller productions, an alternative establishment of eligible funding according to the historical CE is proposed in the final request.

6.4.1.2 Integral Skin/Flexible Molded Foam Producers

According to the chemical suppliers the total installed production capacity for integral and moulded flexible foam is about 13,000 MT per annum. The estimated total production at present is 7,778 ODP T. The market growth is tremendous, since most of the manufacturers produce for the automotive sector, the growth rate is similar to the annual vehicle sales which grow at a rate of 20 to 30 % for the last 7 years.

Sector	Num-ber	Products	Combined CFC –Consumption (t/y)	Replacement Technologies
Integral/Molded skin	12	Steering wheels, dashboards, carpet insulation, armrests, Seats	193.8	Pentane, WB

Table 6.19 Remaining fundable enterprises in the Integral/Molded flexible foam sector

Iran has selected Pentane and water-based solutions for the integral skin/molded foam sector, because of the important role of this sector for car manufacturing for local and potentially growing export markets. All existing production for export is already produced with water-based or pentane based systems. However, the remaining enterprises in the sector do not want to risk this market potential for the future. Especially the larger manufacturers want to apply technologies that are up to European environmental and production standards, which excludes the possible use of 141-B.

Therefore, the main producers of integral skin systems prefer the use of pentane based systems in order to apply with the requirements of the major car manufacturers, e.g. in terms of skin quality. Pentane is a zero ODP solution which is used by European manufacturers. It requires a significant amount of change in the production process to meet safety requirements. It has a large production

capacity and is therefore only selected for the larger enterprises. The incremental capital costs for Pentane technology for integral skin manufacturing per enterprise are based on the following costs:

Equipment cost	US$ 207,000
Trials and training	US$ 12,000
Technology transfer	US$ 7,000
Total per enterprise	US $ 228,000

Table 6.20 Incremental capital costs for integral foam sector

For flexible molded foams Iran promotes the use of water blown technology. It is also a zero ODP solution. The flow and cure characteristics during foaming are not identical to CFC-11 and HCFC-141b. It requires in-mold coating to ensure uniform surface. It also requires the change of testing method and quality standards of final products. All remaining molded foam enterprises under this sector strategy will select water blown technology. They will purchase in-mold coating, install ventilation system, and modify molds.

The minimal incremental capital costs for water-based technology for integral/flexible-molded foam per enterprise are based on the following costs:

Equipment cost dispenser and moulds	US$ 80,000
Trials and training	US$ 10,000
Technology transfer	--
Total per enterprise	US $ 80,000

Table 6.21 Incremental capital costs for molded foam sector

For the IOC calculations an average incremental cost of 1.03/kg CFC (0.233 for Pentane and 1.538 for 141-b conversions) are used in the calculation, amounting to a total of 95,756 Us $ for all 13 enterprises .

Some of the companies, especially the larger ones, have 2 and 3 production lines to be converted. Wherever possible a rationalization of these lines was proposed. The total demand for incremental costs has been calculated to be 2,655,997 US $ for all 11 enterprises. The investment will lead to a phase out of 193.8 ODP T which is equal to a cost efficiency of 13.7 US $ per kg ODP. For detailed information please refer Part II ANNEX XIII Table XIII.2.

6.4.1.3 Flexible Slab stock/Bloc foam Producers

Total installed production capacity for flexible slab stock foam is about 49,000 MT per annum, but the present production, according to the chemical suppliers is only approximately 23,833 MT per year. The vast majority of foams produced in the I.R. of Iran have density of 15kg/m³ and require blowing agent. The manufacturers expect the market share for 15 kg/m^3 flexible foam to grow by about eight per cent per annum.

The objective of this project is to eliminate the use of CFC-11 in the production of flexible slab stock foams. CFC-11 is used to produce low density and, therefore, lower cost foam mattresses and furniture.

Sector	**Num-ber**	**Products**	**Combined CFC – Consumption (t/y)**	**Replacement Technologies**
Slabstock/Boxfoam	10	Matresses, furniture, sponges	225.7	LCD, MC,LIA

Table 6.22 Remaining enterprises in the flexible foam sector

The existing larger production process is proposed to be converted to liquid carbon dioxide as the blowing agent. The break-even point for a continuous production is approximately at 600 ODP T per annum. Therefore, only enterprises that can meet the respective economic strength have been selected for conversion. The government and the companies have decided to use carbon dioxide as an ultimate solution and follow the developments in the neighbouring European market.

LCD is a environmentally friendly technology and it has zero ODP. The adoption of LCD technology requires installation of equipment that meets the following functions:

a) Bulk storage and temperature control of the liquid carbon dioxide and re-circulation of the carbon dioxide; this also includes refrigerated pipe work and valves from the carbon dioxide storage to the inlet of the carbon dioxide metering unit, and an LCD metering and temperature control unit;
b) High pressure material supplying system;
c) High pressure mixing of polyol and carbon dioxide;
d) High pressure mixing head and pipe work; and
e) Platform, power panel and control panel, mixing head and froth cleaning unit.

The use of LCD also requires adjustment of formulations. So far, there has been limited experience in Iran of adopting local chemicals on LCD slab stock equipment even though there are many Iranian enterprises who selected LCD technology for replacement. They are either in early stages of implementation or their procurement has just started.

The Technical Assistance Program which will be established after the approval of this sector plan will help all LCD users to further adjust formulations and modify production process. The experiences of approval LCD projects will be shared with enterprises in the sector plan. The NOU will coordinate the purchase of LCD equipment to enable economies of scale.

The costs of the LCD units is comprised as follows

Incremental capital costs	US$ 380,000
Civil works, trials, and training	US$ 55,000
Technology transfer	US$ 10,000
Process and after service	US$ 30,000
IOCs calculated –0,1 US $/kg CFC	US $ - 5,720
Total	US$ 469,280

Table 6.23 Overview Incremental Costs of LCD conversion

The IOC and incremental costs calculation are largely based on the latest findings of LCD Study in Document 39/38. For detailed information please refer Part II ANNEX XIII Table XIII.2.

Box Foam

As described earlier MC is not the preferred technology for box foam producers. However, as it is the least cost solution, it is used for calculating incremental costs in the sector. The government will provide for all box foam producers technical advice through the technical assistance program and promote the use of variable pressure technology (VPT). The conversion costs are provided below.

Table 6.24 Incremental retrofitting costs per CFC –11 line conversion to MC technology

Incremental capital costs	US$ 20,000
Technology, trials, and training	US$ 10,000
Technology transfer to be covered through the IFTAP	--
Total	US$ 30,000

The required incremental costs for 10 enterprises in the flexible foam sector would amount to 2,970,000 US $. The investment would lead to a phase out of 225.7 ODP T which is equal to a cost efficiency of 13.1 US $ per kg ODP. However because of the exceedingly high cost effectiveness, it is proposed to establish the total required costs based on the historical cost effectiveness.

6.4.2 Non-investment activities

6.4.2.1 Iran Foam Technical Assistance Program (IFTAP)

The Iran Foam Technical Assistance Program (IFTAP) will help to assist foam producers in adjusting their production towards CFC production methods. Experiences from Iran and other countries have shown, that especially in smaller enterprises foam companies find difficulties in adapting to non-CFC technologies. Phase out practices require new additives and new chemical formulations, the use of new equipment often requires more complex understanding for operation and maintaining a proper production. Without respective service at hand not only the replacement of CFC is at stake but moreover, the whole investment in new equipment may well be wasted.

The IFTAP will supply important services to all foam subsector clients such as:

- Assistance in applying CFC free chemical formulation and additives
- Advise/support in equipment handling, contact to suppliers in case of serious malfunction of equipment
- On site assistance in trials and test production
- Generation of additional support through system houses and suppliers
- Central testing of foam samples
- Certification/labelling of CFC free foam production
- Ensure sustainable CFC free production of already funded projects through assistance in trouble shooting.

The IFTAP will be a backup unit for the whole of the MF funded activities in the foam sector. Instead of receiving operational costs, local manufacturers will get access to training and on site expert assistance. The amount of assistance provided will be varying from sector to sector and depends on the production range and size. Additional support will be requested through suppliers and associations.

The IFTAP is focused on assistance for SME manufacturers and is based on comparable commercial services already in existence for large scale manufacturers, e.g. in Europe. The IFTAP will be run by local expert trainers who will receive an international training update prior to the start of the program.

Funding requirements

Item	Activity	Total US $
1	Training of local expert trainers in international training institutes (14 days)	26,400
2	Equipment for Test station and educational models	52,800
3	Three year assistance contract for 100 days / Trainer/year	135,000
4	Consumables for testing and administration	8,300
5	Rent for central foam test laboratory	36,000
6	Transport	32,400
7	PR Materials	11,600
	Grand Total	**302,500**

Table 6.25 Costs Overview Technical assistance activities

6.4.2.2 Program Start Up Costs

To initiate the final sector phase out activities and in order to inform the sector audience it is planned to hold a sector fair and conference with several workshops on sub sector issues in Tehran. During this fair, suppliers for chemicals and machinery will introduce their products in the exhibition hall. A fair will offer the possibility to provide a forum for innovative suppliers, associations, manufacturers and officials to take keen interest in the new CFC products and production processes. Key speaker international and national will provide their experience with new technology and promote the advantages of CFC free technology. The fair will include also manufacturers which have already funded projects.

Funding requirements for the national fairand program start-up:

Item	Activity	Total US $
1	**Fair location**	**2,000**
2	**Invitation of international Speakers**	**15,000**
3	**Exhibitions**	**10,000**
4	**Consumables/Supplies/ Material development**	**15,000**
5	**Shipment Transfer costs Movers**	**6,000**
6	**Announcements registrations**	**5,000**
7	**Support Staff**	**5,000**
8	**Travel and overnight support for invited participants (>60)**	**38,000**
	Grand Total	**86,000**

Table 6.26 Costs Overview Foam Program Start Up Costs

6.4.3 Costs and impact of the foam sector Phase Out

While the identified enterprises may all be eligible for MLF funding, the remaining fundable consumption for Iran does not allow allocation of sufficient funding to cover all eligible enterprises. Therefore, the funding requirements are evaluated taking the proportional remaining fundable consumption for each subsector that will meet the minimal required costs in each subsector (for detailed list see Annex XII).

Sector	Num-ber	Products	Combined CFC –Con-sumption (t/y)	Replacement Tech-nologies	Equipment Costs	IOCs
Rigid Foam						
Subtotal	11	Sandwhich Panels, Insulation Panels,Doors,	218.9	Pentane, WB, 141 B	2,177,000	79,720
Integral/Molded skin						
Subtotal	12	Steering wheels, dashboards, carpet insulation, armrests, Seats	193.8	Pentane, WB	3,260,000	59,613
Slabstock/Boxfoam						
Subtotal	10	Matresses, furniture, sponges	225.7	LCD, MC,LIA	2,970,000	-17,000
Total	***33***		***638.4***		8,407,000	***122,333***

*detailed list of enterprises, products, production and consumption can be found in the Annex XIII
Table 5.11: Overview number of remaining enterprises in the foam sector and related CFC consumption

Because the total costs exceed the individual cost threshold in the subsectors, alternatively to the above calculation the costs are calculated on the basis of the historical CE in each individual sector:

COSTS Foam Sector				
Investment components	**Subsector consumption**	**Funding allocation**	**CE**	**Requested Funds**

Rigid Foams	218.9	218.9	7.65	1,674,585
Integral skin	151.8	151.8	14.98	2,273,782
Molded	42.0	42.0	9.10	382,215
Flexible Bloc	225.7	130.8	5.10	666,963
Contingencies				
Non-Investment Components				
Technical Assistance Program; Stakeholder Workshop		32.4	12.00	388,500
Total	**638.4**	**575.8**	**9.35**	**5,386,046**

Table 6.27 Overview of remaining fundable consumption in the sector and funding requested

The requested amount 5,386,407 will lead to the phase out of 575.8 T ODP of fundable CFC in the foam sector. This brings the cost efficiency down to 9.35 US $/kg CFC. If additional eligible and non-eligible consumption from foam enterprises are identified during implementation, the costs of conversion for these additional enterprises will be covered by the funds already approved for this Sector CFC Phase-out Plan and the government of Iran will not demand further assistance.

The requested amount will lead to the phase out of 631,4 T ODP of eligible CFC in the foam sector. This brings the cost efficiency down to 7,6 US $/kg CFC. However, if the remaining fundable consumption is applied the cost effectiveness is 9,4 US $/kg.

6.4.4 Implementation of the foam sector activities

Phasing-out CFC consumption in the remaining enterprises of the foam sector will be done under the sector lead of GTZ. UNIDO will be cooperating in case of the planned conversions to HCFC 141-B. The projects will be grouped and assigned by the NOU in cooperation with GTZ on the basis of size, level of organization, location and customer base of enterprises concerned. Given the the type of remaining enterprises in the sector, with generally inadequate in-house technical capabilities, the need for adequate investments for plant and process changes, supported by investments on adequate technical assistance, trials and training, is critical and will involve proportionately larger inputs. It is foreseen that the durations for the sub-projects would be set in such a way as to ensure that the verifiable annual performance targets as may be required for the Sector Phase-out Plan, would be more conveniently quantifiable and achievable.

There are additional enterprises who have reported a consumption of 37.4 ODP tons, but they do not fall under the eligibility criteria of the MLF. CFC phase-out in ineligible enterprises will not be funded under the sector phase-out plan and is expected to take place through the control, which the Government will have through policy and regulatory actions. Any unaccounted or unidentified eligible enterprises will be identified and accommodated within the resources approved for this sector phase-out plan.

6.5 Phase Out activities in the solvent sector

6.5.1 Industrial users of CFC 113

This project will phase out the use of 64.8 ODP T of CFC-113 at the Pars Electric and Iran compressor factory and three spray can manufacturers. The cleaning processes with CFC-113 are primarily used for the precision cleaning of electric appliances and compressors for refrigerators. The ODS solvent is utilized as a degreasing agent in the vapour for cleaning of the parts.

Considering the cleaning requirements of the compressor factories, a selection has been made in favour of the alternative aqueous cleaning processes for precision cleaning, with spraying and ultrasonic in five major stages i.e. washing with surfactant, tap water rinsing, DI-water rinsing and two-stage drying in three major manufacturing workshops. Give batch operation immersion-type closed cleaning machines with programmable transport systems will be purchased within the

framework of this project. The project will employ commercially available technologies applicable to the electric and refrigerator industry in Iran.

The conversion of the spray can manufacturers will require Ex-proof filling stations that can be used to process hydrocarbon replacements that are used as replacements for CFC 113.

6.5.2 Costs and impact of CFC 113 replacement

Spray cans
Equipment changes are needed for the filling lines for the three companies producing CFC-113 spray ans. Additional cost of replacement solvent will be passed on to the customers. A C/E of US$ 4.15/ODP kg is applied, in line with similar projects elsewhere. IOC is US$ 0/ODP kg, ICC is US$ 3.77/ODP kg and contingency is US$ 0.38/ODP kg

Precision cleaning
A C/E of US$ 15/ODP kg is applied, in line with similar projects elsewhere. ICC taken as US$ 12.27/ODP kg, contingency as US$ 1.23/ODP kg and IOC as US$ 1.50/ODP kg.

Budget items	CE Total	ODP	Total
Precision cleaning equipment , IOC's; Solvent/electricity 1,5 US$/kg	15	36	540,000
Conversion of spray can filling equipment; IOC's; Customer incentives	15	28.8	372,000
Total		**64.8**	**912,000**

Table 6.28 Overview cost item solvent sector

The total impact of the project will be 64.8 ODP T. However any consumption in excess will be phased out under this project without request for additional funds.

6.6 Justification for Selection of Alternative Technology

6.6.1 Aerosols

The following alternatives will be considered under this Plan:

Universally, hydrocarbons (propane/butane mixtures) are now the most widely used aerosol propellants to replace to CFC 12, CFC 12/11, and CFC 12/114 mixtures. Dimethylether (DME), compressed and dissolved gases such as nitrogen and carbon dioxide, as well as alternative packaging forms have also played a role in the replacement of CFCs as aerosol propellants.

The 1996 UNEP Technical Options Report on Aerosols Sterilants and Miscellaneous Uses and Carbon Tetrachloride approves the use of hydrocarbons as aerosol propellants. Hydrocarbons also played a major part in the phase-out of CFCs as aerosol propellants in Iran where the industry completed the conversion to non-CFC formulations in 1989.

The only permitted use of CFCs as a propellant is in the manufacture of pharmaceutical aerosol products such as metered dose inhalers (MDIs). This consumption continues today and CFC replacement in specialised pharmaceutical aerosol products such as MDIs has been achieved either by replacement by HFC 134a, or by other forms of dispensing packaging (e.g. with mechanical pumps).

Replacement of CFCs in metered dose inhaler products requires extensive product development, testing, and certification by the relevant Health Authorities. Where HFC 134a is selected as the replacement propellant it must be high purity "pharmaceutical grade" HFC 134a.

6.6.2 Foam

Rigid Foam
The presently available technologies to eliminate CFCs in the manufacture of *rigid polyurethane insulating foams* are:

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

Table 6.29 Presently available technologies to eliminate CFCs in the manufacture of rigid polyurethane insulating foams

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

- Proven and reasonably mature technology
- Cost effective conversion
- Local availability of substitute, at acceptable pricing
- Support from the local systems suppliers
- Critical properties to be maintained in the end product
- 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 enterprises' 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 pre-mixer. It is not suitable for spray foam/ 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 Iran 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 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 pre-mixer. It is not suitable for spray foam applications. It is also less energy efficient and expensive compared to most other technologies.

Integral skin and molded foam

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

CLASSIFICATION	LIQUID TECHNOGY	GAS TECHNOLOGY
LOW-ODP TECHNOLOGIES ("INTERIM")	HCFC 141b	HCFC 22
ZERO-ODP TECHNOLOGIES ("PERMANENT")	PENTANE ALL WATER BLOWN	HFC 134a

Table 6.30 Accepted ODS phase out technologies for integral skin moulded foam

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

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

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 destabilizing 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 pre-mixer.

PENTANE is a technically feasible option, but is generally applicable only with enterprises that are large enough to warrant it from a cost and safety standpoint.

WATER-BLOWN foams use carbon dioxide as the blowing agent, which has no ODP, making water blown a favourable final solution. However, the skin formed is much thinner, and not always suitable, and there is an increased friability.

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 pre-mixer. 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.

Flexible Polyurethane Foaming in slabstock and box foaming

The standard blowing agent for flexible polyurethane foam is carbon dioxide, generated from the reaction between water and an isocyanate (TDI or MDI). Auxiliary blowing agents (ABAs) are used because there are limits on the foam properties that can be achieved with chemically generated carbon dioxide as the sole blowing agent and because of the exothermic nature of the water/isocyanate reaction. CFCs have for many years functioned as the ABAs of choice. Auxiliary blowing agents are also used in flexible slabstock to soften the foam, decreasing the reaction temperature. Zero ODP Substitutes for Auxiliary Blowing Agents are:

Acetone: Acetone is extremely volatile and has a low flash point, and it presents a high risk of fire and explosion. Any machinery used in the conversion to acetone, including ventilation, will need extensive modification to be certified as explosion proof, and strong safety procedures need to be followed and enforced.

Liquid Carbon Dioxide (LCD) Technology: The basic principle of LCD technology is the blending of CO_2 with other foam components under pressure prior to the initiation of the chemical reaction. This blend is then released and, triggered by the decompression, releases the CO_2, resulting in froth. This froth further expands because of the CO_2 released from the water/isocyanate reaction. While the "wet end" (storage, metering and blending of chemicals) of the process requires considerable modifications to allow the storage and processing of liquefied/pressurised CO_2, the "dry end" (conveyor) remains essentially unchanged.

The use of CO_2 as a co-blowing agent has been well known for many years. The advantages are the production of foams with a superior "feel", good cell structure, operating economies and environmental benefits. The disadvantages are relatively high initial investment, more complicated processing, a substantial learning curve and the need to control the exothermic reaction for low density formulations. These can be dealt through providing technical support. The technology is currently offered by a selective number of equipment manufacturers. LCD technology has proven to be commercially viable for a significant variety of foam grades in the 15-35 kg/m^3 density range and applicable to densities as low as 10 kg/m^3.

It is expected that the use of LCD will be the future market standard.

Methylene Chloride (MC): Methylene chloride constitutes the most economical alternative of the auxiliary blowing agents. It requires cooling and is therefore not really feasible for continuous production. With the implementation of adequate safeguards MC is a highly volatile chlorinated substance and considered to be toxic. The volatility can trigger high concentrations in the air. The substance is classified by the USEPA and the International Agency for Research on Cancer (IARC) as a probable human carcinogen. In several other industrialised countries the accepted level is set at a time weighted average (TWA) 8-hour level of up to 50 ppm. Careful handling is therefore required to avoid exposure. Safety measures include proper encapsulation of the production units (not really feasible for continuous production), ventilation of production/storage areas, safety training of personnel and industrial hygienic monitoring. However, even if MC would be a realistic option, the implementation of adequate safety standards as required in Europe would be off setting the possible economic advantages of MC vs. the LCD technology.

MC is a cheap replacement for CFC, the "learning curve", however, can be considerable, as the process is less forgiving. Also, contamination of MC with iron can cause severe scorching. "Urethane Grade" MC is not available or affordable only in some cases.

MC is currently widely used as replacement technology in many countries. However owing to toxicity concerns, pending regulatory initiatives may further limit the allowable MC emissions in some countries in the near future. This limits the status of methylene chloride to the status of an interim technology.

Additives: Several additives have been developed to modify the chemistry of the flexible PUF production process. These additives are predominantly for softening and do not allow very low densities. Some additives can be used in addition with ABA's and reduced TDI index.

The lower TDI index decreases the exotherm and allows simultaneous lowering of the product density through the increase of water, which is the principal blowing agent in all flexible PU foams.

Several technologies have surfaced, that could be classified as "mechanical" replacement technologies for the use of CFCs in flexible PUR, predominantly slab stock. The "mechanical" technologies allow the integration of the curing area in the emission control, or allow elimination of the use of an auxiliary blowing agent altogether:

Accelerated Cooling Systems:
Chemical modifications allow water technologies to be more widely used. These modifications have been effectively applied in foam softening, but fall short in density reduction. The heat generated from the reaction between water and TDI limits the use of chemically generated CO_2 as the sole blowing agent. In order to increase the amount of water up to a level that would permit the complete elimination of the use of an auxiliary blowing agent for the purpose of density reduction would require accelerated dissipation of this energy. Despite the very high danger of accident, if wrongly applied, the chemical costs are not lower than those of other auxiliary blowing agents. Capital costs are highly dependent on local layout and sometimes impossible to apply at an economic scale.

Variable Pressure Systems: It is well known that the blowing efficiency increases with decreased atmospheric pressure. This allows that even at higher altitudes lower density foams can be manufactured using less, or no, auxiliary blowing agents through a higher effectiveness of the water/TDI generated CO_2. This principle can be applied at lower altitudes by encapsulating the foam production line and then reducing process pressure. Conversely, the increase of pressure reduces the effectiveness of the water/TDI induced gas generation and in this way allows the generation of higher urea levels (a by product of this reaction). The technology is patented and subject to a license fee.

Iran has selected the LCD technology, because:

- LCD is a long term solution
- LCD has little safety implications compared to other technologies
- There is no need to change the conveyor
- LCD is the leading world market standard
- LCD has operational savings in the long term
- The present quality of products can be maintained
- The present production level can be maintained
- There is no major change needed for the layout of the production area
- LCD is in line with the national and international environmental policies

6.6.3 Solvent

Selection of alternatives to CFC 113 for the small remaining consumption of CFC 113 in the solvents sector 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 for guidance in selecting alternatives. All proposed alternative technologies will be reviewed in the frame of the solvent sector phase out by the expert consultants assisting NATIONAL OZONE UNIT in project implementation before any project activities in this sector will be allowed to proceed. This is to ensure that all environmental, health, and safety requirements are adequately addressed.

6.6.4 Commercial refrigeration

At the present time, the commercially developed options to replace CFC 12 refrigerant in commercial refrigeration equipment are limited to the following choices:

CLASSIFICATION	TECHNOLOGY
LOW-ODP TECHNOLOGIES ("INTERIM")	HCFC 22
ZERO-ODP TECHNOLOGIES ("PERMANENT")	HFC 134a, HFC Blends (R404A, R507) for low temperature applications, & Hydrocarbons (iso-butane, or propane/butane blends)

Table 6.31 Commercially developed options to replace CFC 12 refrigerant in commercial refrigeration equipment

HFC 134a is non-flammable, it has no ODP, and the refrigeration system capacity and efficiency remain unchanged when an optimised compressor designed for HFC 134a duty is used. HFC 134a is therefore universally accepted as a CFC 12 replacement for commercial refrigerators and freezers. HFC 134a is widely available, the technology is mature and in use in most Developed Countries, as well as many Developing Countries. Replacement of CFC 12 by HFC 134a requires relatively modest changes to existing production facilities. These include a change of filter drier material, and appropriate measures to avoid moisture absorption by the synthetic polyol ester lubricant used in HFC 134a compressors. While HFC 134a does have a significant GWP, it nevertheless is considered as a "'permanent" long term replacement for CFC 12 as a refrigerant in commercial refrigeration applications.

HFC blends such as R404A or R507 are now also well established as replacements for CFC 12 in low temperature applications when replacement with HFC 134a cannot achieve the design operating temperatures. These HFC blends have similar properties to HFC 134a and replacement of CFC 12 by R404A or R507 requires similar, relatively modest, changes to existing production facilities as those required in a change to HFC 134a.

Another alternative to replacing CFC 12 in low temperature refrigeration applications is the use of HCFC 22. However, HCFC 22 has a small ODP, it is a controlled substance under the Montreal Protocol, and as such its use will eventually be phased-out. Therefore, HCFC 22 must be regarded as an "interim" solution that will require a change to an appropriate zero-ODP technology such as R404A or R507 at some future date. The advantages of HCFC 22 are that it is compatible with mineral oil and it has been widely used in the refrigeration industry for many years. System redesign will be involved in any conversion from CFC 12 to HCFC 22 in order to take into account the higher operating pressures and compressor discharge temperatures associated with HCFC 22.

Hydrocarbon refrigerants, both Iso-butane, and propane/butane mixtures, have been the choices of some enterprises, particularly in European countries for domestic refrigerators and some commercial refrigeration applications with small refrigerant charge sizes. The advantages of selecting a hydrocarbon refrigerant to replace CFC 12 are that the same CFC 12 compressors with mineral oil can be used, and the technology can be considered "permanent" as hydrocarbons have neither an ODP, nor GWP. However, there is a major disadvantage in that hydrocarbons are flammable.

Whilst there is increasing interest in the use of this technology, it has found only limited acceptance in the USA because of safety concerns relating to the flammability of hydrocarbon refrigerants. The use of hydrocarbon refrigerants also will require some redesign of the equipment to ensure safe operation, and always requires extensive changes to existing CFC refrigerator manufacturing facilities to be enable flammable refrigerants to be safely stored and handled.

The transfer of hydrocarbon refrigerant technology to enterprises in Developing Countries requires the support of a technology partner experienced in the production of comparable refrigeration equipment using hydrocarbon refrigerants on a commercial scale. Hydrocarbon refrigerant

technology may not then be a practical or cost effective option at many smaller scale enterprises due to the technology assistance and safety-related modifications required. Transfer of this technology also requires hydrocarbon refrigerant of the required quality that is not presently available locally in Iran.

HFC 152a has also been considered as a candidate for CFC 12 replacement in domestic and commercial refrigeration equipment. However, HFC 152a is also flammable, the technology has not been developed commercially, and questions remain concerning it's stability in refrigerator systems. Furthermore, compressors for use with HFC 152a are not commercially available.
Taking all of the above factors into account, HFC 134a, or HFC blends, are the most appropriate choice to replace CFC 12 as the refrigerant in commercial refrigeration manufacturing operations at small and medium scale enterprises.

To replace CFC 11 as the blowing agent in the manufacture of PU insulation foam for commercial refrigeration equipment the same options apply as described in the chapter FOAM above for rigid PU foam. As the enterprises that are still using CFC technology are all SMEs, the most appropriate choice to replace CFC 11 as the blowing agent is HCFC 141b. Cyclo-pentane 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 the Islamic Republic of Iran 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 cyclo-pentane, in the future.

6.6.5 Mobile air-conditioning

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

6.6.6 Government’s statement on the use of HCFC’s as interim solutions

The Islamic Republic of Iran is fully aware of the MLF ExCom Decisions relating to CFC 11 replacement technology selection that "presume" against the use of HCFCs. However, such HCFC based technologies are not prohibited and may still be considered eligible for MLF assistance. GTZ will review the use of HCFCs during the implementation of this National CFC phase out plan. Iran has a preference for non-ODS substances and will enforce the general policy whenever possible.

7 CAPACITY BUILDING AND TECHNICAL ASSISTANCE FOR GOVERNMENT AND PUBLIC SECTOR

In addition to the sector-specific technical assistance, four additional components are proposed and included in the National CFC Phase-out plan. These are:

- Regulatory and Policy Support
- Customs Training
- Public awareness activities
- Project Implementation and Monitoring Activity;

7.1 Regulatory and Policy Support

Any activity to phase out ODS in the country has to be sustained through an appropriate policy (containing both investment and non-investment components) and a comprehensive regulatory framework. During drafting of legislation, the country has to ensure that enforcement will be possible and will have to provide for the necessary awareness raising, training, co-operation between different governmental departments, and continuous monitoring to enable improvements to regulations based on day-to-day experience.

The following elements include a part on regulations to be enacted in the short term, as well as the creation of the infrastructure to ensure the regulation stays up to date and are enforced.

7.1.1 Regulations

The project management team will assist the Ozone Office to undertake the following:

- Optimise and implement the ODS licensing system, quota system, and registration of importers.
- Encourage conversion of CFC-containing equipment through technical assistance and grants to enterprises/agencies in need of financial assistance to convert to non-CFC equipment.
- Adopt codes of good practices for refrigeration technicians
- Develop a certification system for refrigeration technicians
- Establish government policy to expedite the phase out for government-owned facilities.
- Establish incentives for increasing use of alternatives.
- Attach conditions to all import licenses and stepwise prohibition of CFC sale to enterprises that do not have an ongoing CFC phase-out project;
- Monitor the existing legislation on CFC 11 imports to guarantee the needs of CFC 11 imports for the service of CFC 11 based centrifugal chillers in the central air-conditioning and industrial refrigeration sectors;
- Monitor that imports of CFC 113, and CFC 114, as pure substances, and in mixtures, are only allowed to provide for the needs of any ongoing projects or essential uses until end of 2006;
- Prohibit the import of CFC 115 as a pure substance, and in mixtures such as R502, as there are no known ongoing needs for these substances;
- To enforce the existing prohibition on the use of CFCs in aerosol products except for recognised essential uses from 2004 onwards;
- To enforce all amended legislation on the import of all Annex A CFCs from 2004 onwards;
- To include pre-mixed CFC 11 polyol in the list of restricted products whose imports require review and approval from 2003 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 revise all Federal and State Transport legislation to permit the unhindered transportation of recovered and recycled CFCs between enterprises and regional CFC recycling/reclaim centres, and vice versa.

7.1.2 Institutional arrangements for the policy and regulatory framework

For effective policy setting as mentioned above, a Policy & Enforcement Centre will be installed under the direction of appropriate Departments (to be decided by the country, could include NOU, Customs and Commerce). A specialised officer coordinates the activities with other officers / Departments.

Tasks of the Policy & Enforcement Centre:

The Centre will make recommendations on amendments to national legislation based on a thorough analysis of the legislation and monitoring of its implementation. The Centre will prepare the draft reports for submittal to the Ozone Secretariat conform Decision XIV/7 of MOP-14. The Centre will develop procedures and guidelines for addressing illegal activities by coordinating with different governmental departments involved. Information sessions will be organised for officers on procedures and guidelines for follow-up of illegal activities that would impact adversely on the CFC phase out proposed in the document. These information sessions will be directed to all government departments concerned, including the NOU, Ministry of Commerce, Customs, the Judicial Department, police, and other relevant authorities involved in the implementation of the CFC phase out plan in Iran.

The expected result is to:

- Improve existing ODS regulations to ensure compliance with the agreed calendar of CFC- phase out plan
- Enhance the capacity of the government officers to target and capture ODS smugglers,
- Develop a database with information on illegal ODS trade activities in relation to the country
- Accurately register authorised import of CFC and CFC using equipment upon entrance to the country
- Report to the Ozone Secretariat conform Decision XIV/7, par 7 of MOP-14

The criteria for success will be:

- Iran follows the CFC- NPOP calendar
- Improvements of ODS regulations in Iran
- The number of activities undertaken to prevent illegal trade, including inspections by customs officers, development of national networks, development of guidelines for investigation of suspect activities, and reports on cases of illegal trade.

Co-operating partners and their role

The NOU, Customs Department and other national relevant agencies will be involved from the start of the project. The CAP team in ROAP will be involved for necessary technical assistance on enforcement issues.

Time frame and milestones

Activity	2003	2004	2005	2006	2007-2010
Establishment ODS/Enforcement Centre	X	X			
Assist in the development of certifcation and licensing system					
Operation Enforcement Centre		X	X	X	X Iran
2 Information Sessions for governmental officers			1	1	

2 stakeholders consultation meetings on policy			2		

Detailed budget

Activities	**US$**
Experts; including fees, travel and DSA	CAP
Establishment of an Enforcement / Investigation Centre costs for five years	125,000
Local Consultants (drafting ODS regulations, codes of good practice and certification of Refrigerant technicians) for three years	30,000
Organisation 2 stakeholders consultation meetings on policy	20,000
Organisation of 2 information sessions for governmental officers	20,000
Technical Materials for Enforcement workshops	3,000
Substantive Assistance on Enforcement issues	CAP
Provision of Office space	Iran
Operational costs from 2007 on	Iran
TOTAL PROJECT COST	198,000

7.2 Training for Customs Officers

First of all Iran will need support to fill up the lack of specific customs codes for CFC and lack of regulations for their control - I.R. Iran has approximately 110 import / customs stations. The institutional structure within I.R. Iran needs more organized and efficient systems to monitor and control the imports of CFC or CFC containing equipment in the country.

Customs statistics may not be as accurate as need to be due to customs officers being untrained in recognizing and identifying CFC. The Government is thus seeking to train its customs officers to implement more detailed import classification and in recognizing ODS and ODS containing equipment to control and ensure that acceptable products are entering the country The customs department and authorities responsible for compilation of statistics will be involved in this training activity to enhance the co-operation between these administrative units. The technical aspects of the training will be concentrated in the customs laboratory in I.R. Iran. It is imposing discriminatory measures on importation of ODS. Imposing direct measures on ODS imports like punitive taxes, direct bans, permits, licenses or quotas may result in unexpected trading patterns, parallel activities and punish the low income earners through higher prices and non- availability of service. On the other hand, the importation and local production of non-ODS equipment needs incentives, which talks for the restrictions in imports.

To sort out the feasibility of restrictive measures on the imports of ODS and ODS containing equipment, it is proposed that an expert group will be established. This group should analyse the practical possibilities to impose any restrictive measures and their envisioned repercussion on the actual ODS and ODS containing equipment trade.

This project aims at Training customs officers (inspectors, controllers and customs policemen) to enable them to identify:

- Controlled substances under the Montreal Protocol
- Imported refrigerators, freezers and other refrigeration equipment using CFCs
- Providing CFC-detection equipment for customs entry points in the country.

In addition this project will allow the customs department to create a database on imported ODS. Developing and imposing clear rules (bans, quotas, licenses) to actually restrict ODS and ODS

containing equipment imports. The implementation of this activity will be made in a manner and publicity that supports the training and recovery-recycling projects.

The implementation of this training project will result in:

- Development of reliable and valid statistics on national ODS consumption
- Identification of ODS, ODS-using and ODS-containing equipment and discouraging parallel activities
- Accurate implementation of restrictive import and resulting in decreasing importation volumes
- Enhancement of the local non-ODS equipment production
- Feed-back e.g. to the Ozone Office; needs to modify rules and regulations

The expected result is a more efficient control of ODS and ODS using equipment upon entrance to the country and enhancement of the entry of non-ODS in the market. The successfulness of this activity can be observed indirectly only. The main issue is to create awareness in the trade and business and direct them to seek for new opportunities with non-ODS instead of continued ODS trade. The imported ODS volumes should continue to decrease steadily.

Belo the costs breakdown of the Custom Training is illustrated:

Item	No Units	Cost	Budget US$
International expert (travel, DSA, fee) for technical training and local Consultants	1	20,000	20,000
Local organization (220 persons for 3 days)	220	50	11,000
136 ODS identification kits @ US$ 1000	136	1000	136,000
Freight cost (5% of Equipment cost)			6,800
Training material & aids	300	10	3,000
Travel & per diem for outstation participants (220 persons for 3 days @ US$ 30per day)	660	30	19,800
Monitoring of training program on effectiveness of implementation of import/export policies and the impact on reduction in consumption	1	10,000	**10,000**
Sub-total			**206,600**
Contingencies (10%)			22,600
Total			**229,200**

Table 7.1 Total costs Customs Training

The total cost of this Training for Customs Officers project is US$ 229,200.
Details of the project are appended as ANNEX X.

7.3 Public Awareness

Continued awareness on ozone issues is necessary to support existing phase out projects in Iran. There are several indications, that the level of understanding of both the general public and the main stakeholders in ozone protection is quite low, and needs to be increased.

Addressing the general consumers will be one component of the strategy though in a limited way. Therefore, the objectives of the awareness component of the NPOP will be:

- Disseminate information related to the Government's policy to phase out all Annex A CFCs;

- Inform the various CFC consuming enterprises on the availability financial and technical assistance provided under NPP;
- Raise public awareness on the environmental and economic impact of ozone layer depletion through newsletters, news articles, seminars, radio and tv spots;
- Support and promote the use of certified technicians and products among end users;
- Support the public outreach programs as described under the relevant projects.
- Complement and support the CFC phase out plan and the policy and regulatory framework;
- Complement and integrate with the regional awareness strategy;

In order to achieve these objectives the project team will

- Establish a Task Force responsible for developing a national awareness/communication strategy for Iran as an integral part of the regional strategy.
- Undertake a baseline survey on the current level of awareness in Iran, to feed into the strategy preparation.
- Provide a working national strategy for awareness and communication on ozone protection
- Disseminate to enterprises, associations and suppliers information related to the Government's policy to phase out all Annex A CFCs through press releases, brochures and other media;
- Build networking capacities with named stakeholders
- Develop and produce educational media in order to motivate demand for CFC conserving and replacing attitudes in the private and public sector and provide strategic partners with localized materials for promotion of the NPP objectives;
- Build appropriate media channels through which sector audiences can easily communicate in local language and access key information
- Support and promote the use of certified technicians and products among end users
- Inform CFC using enterprises on the availability of financial and technical assistance provided under NPP;
- Increase regional coordination and communication on the said issues
- Operationalise awareness activities and provide timetable for implementation
- Illustrate ways to objectively verify increased awareness amongst the target groups and increase the market for CFC free products
- Draw the public attention to the sustained application of project investments

As a result there will be an increased participation by all stakeholder demand for CFC-free products will go up and general awareness will develop a supportive environment for the NPP project.

Co-operating regional partners and their role

The NOU, and other national relevant agencies and NGOs working in the field of communications will be involved from the start of the project. The CAP team in ROAP has committed advice, and asssist in review drafts of awareness raising materials. The Communication Strategy for Global Compliance with the Montreal Protocol was approved by the Executive Committee for implementation by UNEP at its 40th meeting. The CAP team in the UNEP Regional Office for Asia and the Pacific are in the process of developing a regional awareness strategy which will provide guidance to countries in the region for identifying and implementing specific awareness activities that will be undertaken in the countries, in response to their specific needs. Public awareness activities that are proposed to be undertaken in Iran will be synergised with the elements of that regional strategy, and their resources will be applied wherever possible.

Detailed budget

Activity	Unit	US $	US $
Strategy and follow up on awareness			

Complete baseline data on current level of awareness	1	10,000	10,000
Develop a NPP communication plan	1	6,000	6,000
			0
Sector support			0
Publication/Promotion of NPP success stories	5	3,000	15,000
Media exchange, central documentation	5	1,000	5,000
Intersectoral Networking and Meetings			0
Regular Network meetings with chemical and machinery suppliers, associations	5	8,000	40,000
Policy round table meetings on alternatives and policies and regulations by the government	5	5,000	25,000
			0
Media Development			0
Newsletter			0
Development	1	6,000	6,000
Editions	7	3,000	21,000
Internet			0
Web Site development	1	15,000	15,000
Content Management	7	5,000	35,000
Video, TV footage			0
Production	1	40,000	40,000
TV/Radio Productions	1	10,000	10,000
Educational materials			0
Posters	1	30,000	30,000
Brochures, Booklets	4	10,000	40,000
other Print	1	5,000	5,000
Regional Integration/Communication			
Substantive Assistance on awareness issues			CAP
			0
Administration			0
Local Media consultant	5	6,000	30,000
Translations/Localisation of material	1	10,000	10,000
Cost for est. Of task force			Iran
Provision of Office space for Awareness task force			Iran
Grand Total			**343,000**

7.4 Project Implementation And Monitoring

The implementation of the National Phase out plan will entail a significant amount of administrative work. The involves for example

- Assistance in the development of policy and regulatory framework
- Monitoring of markets and identification of potential additional end-users
- Database on CFC users and certified trainees
- Development of project proposals at enterprise-level
- Resource allocation for investment and non-investment activities
- Public awareness activities
- Coordination of implementing agencies and their activities
- Preparation of annual implementation plans
- Advising of stakeholders in relevant questions

- Coordination of technical assistance activities
- Audit work
- Reporting requirements

The administration and monitoring of the CFC NPP requires a permanently employed task force to provide the Government with necessary support to carry out all activities proposed under this plan. The following activities, but not limited to these activities, will be managed or carried out by a Implementation Management Facility (IMAF).

7.4.1 Work division between the implementing agencies

The project will be implemented as a collaborative effort of six implementing / bilateral Agencies, namely UNDP, UNIDO, UNEP, France (AFD), Germany (GTZ), Japan. All of those have their specific experiences and areas of excellence to bring to the process. All agencies have close links to Iran, to the activities under this strategy and have made considerable experience to base their efforts on.

GTZ
GTZ will be the lead agency in the implementation of the NPP. The work within this project will be financed from the bilateral quota of Germany's contribution to the MLF, which GTZ is implementing. The specific expertise of GTZ lies in project management assistance, industry cooperation, procurement services, training and technical advice. GTZ will be responsible for the overall coordination and the coordination of all remaining sectors, which are not covered by other implementing agencies, most importantly the foam sector, where GTZ has already prepared a foam sector phase out plan.

UNDP
UNDP has carried out a large number of projects in the refrigeration manufacturing sector world wide; UNDP will be responsible for the implementation for the refrigeration manufacturing sector program and closely coordinate their responsibilities with UNIDO, who is co-implementing activities in this sector.

UNIDO
UNDP has been the most active implementing agency in Iran. UNIDO will be the coordinating agency for the implementation of the RMP activities. It will closely cooperate with UNDP in the refrigeration manufacturing sector and will implement some of the projects for refrigeration manufacturing, which had previously been prepared as individual projects by UNIDO and are now being submitted in the frame of the sector phase out.

France
France will be responsible for coordinating activities in the MAC sector. The work within this project will be financed from the bilateral quota of France's contribution to the MLF, which AFD is implementing. AFD has already implemented a pilot project in the MAC sector and is well experienced to lead the remaining activities in the sector.

Japan
In addition to the MLF funded bilateral activities funded by Japan, Japan will bilaterally contribute additional funds for the implementation of a compressor project. This project is essentially backing up the activities in the refrigeration manufacturing and the maintenance sector.

UNEP
There will be also a close cooperation with UNE**P**, which is presently preparing a country program update. UNEP will be responsible for implementation of the regulatory and policy support component. The policies and data in the country program will require close cooperation between UNEP and the other agencies in order to adapt the new country program to the NPP.

Each subsector of the National Phase Out Plan will have a lead agency.

National Phase Out Plan	Lead Agency	Cooperating agencies
Overall, Project Implementation and Monitoring Unit and Public Awareness	**GTZ**	
Regulation and Policy Support	**UNEP**	**Japan**
Customs Training	**UNIDO**	
Subsector activity	**Lead Agency**	
Refrigeration Assembly & Manufacturing Sector	**UNDP/UNIDO**	**Japan**
Domestic and commercial Refrigeration Servicing (RMP)	**UNIDO**	
Mobile units servicing	**France**	**GTZ, Japan,**
Foam sector	**GTZ**	**UNIDO**
Solvent sector	**Japan**	**UNDP**

Table 7.2 Work division and sector cooperation between the Agencies

The lead agency for the implementation of the plan is the GTZ.

7.4.2 Implementation Management facility for the National CFC Phase Out in Iran

The lead agency will establish an implementation management facility (IMAF) for the implementation of the NPP that will work directly under the NOU. The facility will be service oriented for the implementing partners and participating institutions and will support a smooth process of implementation of the NPP.

The facility will have coordinating and mediating responsibilities and will be the central contact for stakeholders and interested enterprises. It will coordinate requests and in cooperation with the NOU it has clearing house functions regarding the release of overall information on the progress and status of implementation of the NPP. With the support of the monitoring facility, the management will be able to evaluate and revise strategies and involve important stakeholders in time.

Among others, the project management team will undertake the following activities:

- Assist the NOU in the preparation of the annual implementation plan
- 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 to 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 “as needs” basis, to assist enterprises to identify appropriate non-CFC technology;
- Review and approve proposals submitted by eligible enterprises;
- Co-ordinate the refrigeration technician training for the refrigeration and MAC service sectors;
- Facilitate the selection of qualified suppliers to supply tools and equipment;

- Develop and maintain a database on names and addresses of technicians and enterprises participating in the technical and educational assistance activities under the NPP;
- Assist the NOU to establish its own independent monitoring and enforcement unit relating to CFC consumption;
- Prepare an annual progress report of the overall implementation of the National CFC phase out plan in accordance with any MLF ExCom procedures for this task;

Implementation Management Facility (IMAF)	**Unit**	**Costs**	**Total**
Management officer	6	48,000	288,000
Support Staff	7	12,000	84,000
Technical Support	1	30,000	30,000
Travel Cost and DSAs	6	12,000	72,000
Organisation, Hosting, Running costs			
Office infrastructure			30,000
Office space			Iran
Total			**504,000**

Table 7.3 Implementation and Management Facility for the NPP

7.4.3 Monitoring Unit

The monitoring is planned to be performed annually in time for the first meeting of the Executive Committee. The performance of the previous year will be determined on this basis the tranche for implementation from April to March of the following year will be requested.

In order to supply qualitative and quantitative analysis of the achievements the monitoring needs to provide several preconditions for the implementing partners:

Development of a national inventory and database on CFC use and users.
The database will register all activities related to funding activities under the NPP. It will provide baseline data on enterprises, related associations and other stakeholder. Activities under several sectors will be bundled under the database for coordinated implementation and progress.

The database will note site visits and contacts and make relevant documents available in order to maximise the benefit knowledge acquired in the field. One of the main tasks is to structure and make accessible information that is provided in all kinds of formats from individual sectors.

This way funding requests and consumption patterns of CFC by enterprises can be followed up more closely and workflow between policy, investment and non-investment activities can coordinated in the best sense and the processed information can be substantially used for improved planning and adjustment of following implementation periods.

The system will allow online access and automated reports on implementation progress for all parties involved at any time. Raw operational plans will be available to illustrate actual planning and deadlines.

The project management team will assist the NOU to carry out the following tasks:
- Set up a intranet with updated relevant information and data for implementing partners;
- Exchange information on the actual amount of imported CFCs with relevant government institutions such as the Custom Department agreed on regularly basis (3 month);
- Exchange and monitor the import of CFC alternatives such as HFC 134a, HCFC 22, and HCFC 141b;
- Train monitoring officers to identify and monitor CFC use at the enterprise level;
- Train and include as appropriate, government enforcement personnel to identify and monitor CFC use at the enterprise level;

- Inspect warehouses and storage facilities of CFC, HCFC, and HFC 134a importers;
- Report incidents of illegal import of CFCs;
- Initiate safety inspections and technical audits if required by projects undertaken under this plan;
- Update annually the consumption data and provide the basis for revision of strategy if necessary;
- Provide data for progress reports and annual work plans for submission to the MLF ExCom;
- Do financial monitoring and controlling of all expenditures under the NPP
- Facilitate sub sector managers with overall program data
- Collect and receive gathered input from sector managers and make it generally available
- Agree on reporting frequencies and formats with all participating implementing partners and the MLF administration

However, the monitoring unit will be a very valuable source of information not only for controlling of the implementation, but moreover as a tool for the NOU, customs and implementing agencies. It will service oriented in its structure in order to receive an appreciative support from all parties. The facility will be operating until the end of 2010 in order to document the sustainability and success of total CFC phase out efforts in Iran.

Monitoring Facility			
Monitoring officer	7	24,000	168,000
Travel cost and DSAs	7	12,000	84000
Database development	1	20,000	20,000
Technial support for content mgmnt.	1	10,000	10,000
Support staff	7	6,000	42,000
Regional support, training, staff	7	4,000	28,000
Total			**352,000**

7.4.4 Coordination of Technical Assistance

The technical assistance coordination undertakes the following tasks:

- Coordinate technical know how and experts who take part in national phase out actions;
- Coordinate technical assistance activities throughout the sectors on refrigeration, foaming, raw materials, specific applications and maintain databases on TA contingencies for enterprises;
- Maintain permanent staff to provide immediate support, information to stakeholders enterprises and public in case of technical queries;
- Maintain a highly efficient exchange, multiplication of technical information on substances, processes and equipment;
- Conduct technical audit;
- Organise stakeholder meetings and conferences with industrial and research organisations;
- Communicate with instructors, trainers, production experts on latest developments and country specific solutions.

7.5 Total costs of Project Implementation and Policy Support

The total cost for the Project Implementation and Monitoring Unit project is US$ 1,434,000 and the budget details are as follows:

Project Implementation and Policy Support	
Regulatory and Policy Support	213,000

Training of customs officer (funded under RMP activities)	(229,200)
Public awareness component	343,000
Project Implementation and expert fees	
2004 - 2010 at a cost of 78000/year	504,000
Monitoring Activities /TA	352,000
Subtotal	1,412,000
Contingency	141,200
Total sum (excluding customs training)	**1,553,200**

Table 7.4 Costs for the Project Implementation, Awareness and Policy Support

8 TOTAL COSTS AND COSTS SHARING OF THE NATIONAL CFC PHASE OUT PLAN

8.1 Costs Overview

The ruling principle in the design of the NPP cost structure was to achieve final phase out in each of the sectors and to ensure, that the minimum of required funds can be met within the historically applied cost effectiveness of the country.

There was one principal challenge to overcome in the establishment of the cost structure. The total eligible consumption exceeded the fundable consumption and thus the principally required funds. In comparison to the total accumulated phase out target in the sector, these are minor variations; nevertheless they have important implications for the large number of remaining micro and small enterprises in the country. The attention and support for converting those enterprises is not only a matter of equity, but a necessity to finally turn the country phase out efforts into a sustained environmental and social success.

In order to optimise the effectiveness of the proposed activities, the remaining fundable consumption has been proportionally distributed between the sectors in such way, that the minimum required funds for total CFC phase out could be met. By this approach it will be avoided that certain sectors will lack essential funding, following the limitations of the allowed fundable consumption in a sector.

Where investment necessities could not be met, e.g. like in the foam and refrigeration sector, more cost effective training and technical assistance components were included for compensation. Therefore, these non-investments form a very crucial part in all of the sectors and without those, the envisaged commitment will be completely unachievable.

This observation can be supported by a number of experiences in the foam and refrigeration sector, where the majority of project delays have been related to lack of information and know-how. In building local training and technical expertise, it does do not only enable the I.R. of Iran to compensate for the lack of necessary capital investment, but moreover will form the knowledge base in the country that is necessary to sustain specific sector know how during the critical pass way of final phase out. Thus it will also benefit and contribute to the sustainability of all investments that have been already approved.

From the table below the single and total cost for each individual sector can be seen. In the third column, the requested grant is adjusted to the allocated remaining fundable consumption, which can be lower. The fourth column illustrates the cost effectiveness in the sector. The fifth column provides the cost effectiveness with the inclusion of a weighted part of the costs for management and monitoring of the National Plan.

Subsector activity	Single Cost	Accumulated	Proportional funding request	Funding equivalent allocated	Overall Sector CE	CE incl. NPP mngmnt. cost (weighted)
Refrigeration Assembly & Manufacturing Sector		**3,275,100**	**3,275,100**	**266.8**	**12.3**	**13.3**
Investment Component	2,788,000					
Technical assistance component	409,100					

National Stakeholder Workshop	78,000					
Refrigeration Servicing						
Mobile units servicing		**3,574,239**	**3,574,239**	**326.0**	**11.0**	**11.8**
Investment/ Recovery and Recycling	2,485,900					
Training/TA component	1,088,339					
Domestic/commercial servicing(RMP)		**2,375,000**	**2,375,000**	**475.0**	**5.0**	**5.2**
Investment/ Recovery and Recycling	1,673,800					
Training/TA component	472,000					
(Training of customs officer)	229,200					
Foam sector		**9,636,200**	**5,386,046**	**575.8**	**9.4**	**9.9**
Investment Component	9,247,700					
Technical assistance component	302,500					
National Workshop	86,000					
Solvent Sector		**972,000**	**972,000**	**64.8**	**15.0**	**16.6**
Precision cleaning equipment	540,000					
Conversion of spray can filling equipment	432,000					
Project Implementation and Monitoring Unit		**1,553,200**	**1,553,200**		**12.0**	
Regulatory and Policy Support	213,000					
Training of customs officer	s.RMP					
Public awareness	343,000					
Project Implementation and expert fees						
2004 - 2010 at a cost of 78000/year	504,000					
Monitoring Activities /TA	352,000					
Subtotal	1,412,000					
Contingency	141,200					
Total		**21,385,739**	**17,135,585**	**1,708.4**		**10.0**

Table 8.1 Overview total costs of the NPP

The total cost of the NPP will be 17,135,585 US $, which is equal to a cost efficiency of about 10 $/kg ODS. The total allocated fundable consumption will be 1,708.4 ODP T.

If for reasons that have not been foreseen during submission, the allocation of fundable consumption in a sector will be not acceptable, the I.R. of Iran reserves the right to reallocate such amount to other sectors with eligible consumption that has not already been allocated before.

While the total funding equivalent of the NPP is equal the total consumption reported to Nairobi, there is a shift between the sectors. The funding equivalent in the refrigeration manufacturing sector is 14.4 % low from the total reported consumption in the 2000 baseline to Nairobi. In the foam sector the total funding equivalent is 10 % above the reported baseline. It is commonly accepted that consumption can vary from year to year for economic or other reasons. The illustrated range is well within the variable range in a sub sector that can be expected and cannot be influenced by the country.

8.2 Cost sharing between the Agencies and required Support Costs

As has been illustrated before the requested funding represents a minimum of funds required in order to finally phase out all consumption in the sectors. In a large country with an industrial sector like Iran it is very difficult to foresee all eventualities that may occur on the road to sustained final phase out. Therefore, the I.R. of Iran wants to maintain maximum flexibility during implementation and during distribution of tasks in the subsectors.

In order to avoid a financial automatism the cost sharing between the agencies is not bound to individual activities, but to a cost share of the overall funding. This allows the I.R. of Iran maximum ownership and the possibility react flexible to demand and process. The individual share will be fixed on an annual base between the NOU, the sub sector lead agency and the overall lead agency.

The projects will be grouped and assigned to each agency based on previous implementation experience of each agency and also on the basis of size, level of organization, location and customer base of enterprises concerned until each agencies cost share is matched. Any unaccounted or unidentified eligible enterprises will be identified and accommodated within the resources approved for this sector phase-out plan. The durations for the sub-projects would be set in such a way as to ensure that the verifiable annual performance targets as may be required for the National Phase-out Plan and indicated in the business plan for the country, would be more conveniently quantifiable and achievable.

CFC phase-out in ineligible enterprises will not be funded under the sector phase-out plan and is expected to take place through the control, which the Government will have through policy and regulatory actions.

Proposed Funding for Policy and Implementation

Agency	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**
Policy, awareness, regulation									0
UNIDO		229,200							229,200
GTZ	85,750	85,750	0	102,900	0	68,600	0	0	343,000
UNEP	213,000	0	0	0	0	0	0	0	213,000
Implementation and Monitoring									0
GTZ	99,720	149,580	149,580	149,580	149,580	149,580	149,580	0	997,200
Subtotal	398,470	464,530	149,580	252,480	149,580	218,180	149,580	0	1,782,400

Table 8.2 Funding shares for Policy and Implementation

Proposed Share of Sector Funding

Agency	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**	**Share ODP T based on overall CE**
GTZ	80,000	990,772	980,199	1,159,436	1,032,179	549,189	30,098	0	4,821,872	537
UNIDO	490,984	2,172,027	1,418,721	310,840	256,617	141,040	0	0	4,790,230	533
UNDP	415,39	1,508,34	192,438	0	0	0	0	0	2,116,18	235

	7	5							0	
France	161,584	807,918	0	646,334	0	0	0	0	1,615,835	180
Japan	135,607	963,855	140,574	508,432	125,565	89,890	45,147	0	2,009,068	224

Table 8.3 Shares of sector funding

Overview total annual funding requirements per Agency (including support costs)

Agency	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**
UNEP annual funding	213,000	0	0	0	0	0	0	0	213,000
Support costs	27,690	0	0	0	0	0	0	0	27,690
Total UNEP	**240,690**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**240,690**
GTZ annual funding	265,470	1,226,102	1,129,779	1,411,916	1,181,759	767,369	179,678	0	6,162,072
Support costs	29,202	134,871	124,276	155,311	129,994	84,411	19,765	0	677,828
Total GTZ	**294,672**	**1,360,973**	**1,254,054**	**1,567,227**	**1,311,753**	**851,779**	**199,442**	**0**	**6,839,900**
UNIDO annual funding	490,984	2,401,227	1,418,721	310,840	256,617	141,040	0	0	5,019,430
Support costs	36,824	180,092	106,404	23,313	19,246	10,578	0	0	376,457
Total UNIDO	**527,808**	**2,581,319**	**1,525,125**	**334,153**	**275,864**	**151,618**	**0**	**0**	**5,395,887**
UNDP annual funding	415,397	1,508,345	192,438	0	0	0	0	0	2,116,180
Support costs	31,155	113,126	14,433	0	0	0	0	0	158,714
Total UNDP	**446,552**	**1,621,471**	**206,871**	**0**	**0**	**0**	**0**	**0**	**2,274,894**
France annual funding	161,584	807,918	0	646,334	0	0	0	0	1,615,835
Support costs	17,774	88,871	0	71,097	0	0	0	0	177,742
Total France	**179,358**	**896,788**	**0**	**717,431**	**0**	**0**	**0**	**0**	**1,793,577**
Japan annual funding	135,607	963,855	140,574	508,432	125,565	89,890	45,147	0	2,009,068
Support costs	14,917	106,024	15,463	55,927	13,812	9,888	4,966	0	220,998
Total Japan	**150,523**	**1,069,879**	**156,037**	**564,359**	**139,377**	**99,778**	**50,113**	**0**	**2,230,066**
Total grant requested	1,682,042	6,907,446	2,881,511	2,877,522	1,563,941	998,299	224,825	0	17,135,585
Accumulated Support Costs	157,561	622,984	260,576	305,648	163,052	104,876	24,731	0	1,639,428
Total Costs	**1,839,603**	**7,530,430**	**3,142,087**	**3,183,170**	**1,726,993**	**1,103,175**	**249,556**	**0**	**18,775,013**

Table 8.4 Overview Agency funding and support costs

9 IMPLEMENTATION TARGETS AND FUNDING SCHEMES

9.1 Introduction

Instead of the traditional approach used previously in Iran, where enterprises were identified and individual projects or group projects were prepared for an enterprise, or group of enterprises, this National CFC Phase-out Project Proposal 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.

The project management in cooperation with the monitoring officer will closely follow the following indicators of project progress:

- Progress according to milestones
- Completion of projects
- Sustainability of activities
- Unforeseen problems or complications
- Comprehensiveness of conversions
- Effectiveness of training and technical assistance
- Progress of Phase out targets
- Coordinate countercheck all CFC data available

In the following implementation and operational schedules are provided which include most of the quantifiable indicators of project progress.

9.2 Substances to be phased out under the NPP:

ANNEX A : Group I : CFC-11, CFC-12, CFC-113, CFC-114, CFC-115

9.3 Reductions in funding for failure to comply

In accordance with paragraph 9 of the Agreement, the amount of funding provided may be reduced by US$ 5,000 per ODP tonne of reductions in consumption not achieved in the year.

9.4 Implementation schedule

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

Task	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
Investment Projects - Foam Sector																											
(i) Technical Assessment Conversion Design	X	X			X				X				X														
(ii) Conversion Project Preparation		X	X	X		X				X				X			X										
(iii) Equipment Procurement		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X							
(iv) IFTAP Project Implementation	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	
(v) National Foam Workshop				X																							
Investment Projects – Comm. Ref. Mfg.																											
(i) Technical Assessment Conversion Design	X	X	X			X	X			X	X																
(ii) Conversion Project Preparation		X	X	X	X																						
(iii) Equipment Procurement		X	X	X		X	X	X		X	X	X															
(iv) REFTAP Project Implementation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
(v) National Ref. Workshop			X																								
Investment Project – MAC Service Sector																											
(i) Selection of Consultant	X																										
(ii) R&R Equipment Procurement		X	X	X					X	X	X					X	X	X									
(iii) Train the Trainer Program			X	X	X																						
(iv) Technician Training Programs				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
(v) R&R Project Implementation					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
(vi) National MAC Workshop			X																								
Service Mechanics Training Course																											
(i) Development of Training Course	X	X	X																								
(ii) Equipment Procurement		X	X	X																							
(iii) Train the Trainer Program			X	X	X																						
(iv) Service Mechanic Training				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Investment Project – CFC R&R Project																											
(i) Selection of local Consultant	X																										
(ii) Recovery Equipment Procurement		X	X	X																							
(iii) Technician Training Programs				X	X																						
(iv) Recovery Project Implementation					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				

Regional CFC Recycling Centres																										
(i) Equipment Procurement	X	X	X	X																						
(ii) Set-up of 52 CFC Recycling Centres				X	X	X	X	X	X	X	X	X														
(iii) Project Implementation					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Solvent sector activities																										
(i) Equipment Procurement	X	X	X																							
(ii) Project implementation		X	X	X	X																					
Customs Training Project																										
(i) Development of Training Course	X	X																								
(ii) Train the Trainer Program			X	X																						
(iii) Equipment Procurement				X	X																					
(iv) Enforcement measures						X	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	X	X				
(ii) NPP Publicity Activities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
(iii) Public Awareness Activities	X	X	X			X	X	X			X	X	X				X	X	X							
(iv) Legislation Revision/Regulatory Support	X	X	X	X	X	X	X	X	X	X	X	X	X	X												
(v) Monitoring & 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
(vi) Activity Completed																										X

Table 9.1 Implementation Schedule

9.5 Targets and Funding

YEAR	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Montreal Protoocol Reduction schedule						**CFC-50%**			**CFC-85%**		
Max allowable consumption of CFC	4,571.7	4,571.7	4,571.7	4,571.7	4,571.7	2.285	2.285	2.285	685	685	
Reduction from ongoing projects	n.a.	151.1	116.0		1,120.0	988.0	73.0				
New reduction under plan					484.4	405.4	365.4	256.3	146.8	50.1	
Total annual reduction of CFC	**n.a.**	**151.1**	**116.0**		**1,604.4**	**1,393.4**	**438.4**	**256.3**	**146.8**	**50.1**	
Annual Funding of Agencies				2003	2004	2005	2006	2007	2008	2009	2010
Lead Agency											
GTZ annual funding				265,470	1,226,102	1,129,779	1,411,916	1,181,759	767,369	179,678	0
Support costs				29,202	134,871	124,276	155,311	129,994	84,411	19,765	0
Total GTZ				**294,672**	**1,360,973**	**1,254,054**	**1,567,227**	**1,311,753**	**851,779**	**199,442**	**0**
Cooperating Agencies											
UNEP annual funding				213,000	0	0	0	0	0	0	0
Support costs				27,690	0	0	0	0	0	0	0
Total UNEP				**240,690**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
UNIDO annual funding				490,984	2,401,227	1,418,721	310,840	256,617	141,040	0	0
Support costs				36,824	180,092	106,404	23,313	19,246	10,578	0	0
Total UNIDO				**527,808**	**2,581,319**	**1,525,125**	**334,153**	**275,864**	**151,618**	**0**	**0**
UNDP annual funding				415,397	1,508,345	192,438	0	0	0	0	0
Support costs				31,155	113,126	14,433	0	0	0	0	0
Total UNDP				**446,552**	**1,621,471**	**206,871**	**0**	**0**	**0**	**0**	**0**
France annual funding				161,584	807,918	0	646,334	0	0	0	0
Support costs				17,774	88,871	0	71,097	0	0	0	0
Total France				**179,358**	**896,788**	**0**	**717,431**	**0**	**0**	**0**	**0**
Japan annual funding				135,607	963,855	140,574	508,432	125,565	89,890	45,147	0
Support costs				14,917	106,024	15,463	55,927	13,812	9,888	4,966	0
Total Japan				**150,523**	**1,069,879**	**156,037**	**564,359**	**139,377**	**99,778**	**50,113**	**0**
Total grant requested				1,682,042	6,907,446	2,881,511	2,877,522	1,563,941	998,299	224,825	0
Accumulated Support Costs				157,561	622,984	260,576	305,648	163,052	104,876	24,731	
Total Costs				**1,839,603**	**7,530,430**	**3,142,087**	**3,183,170**	**1,726,993**	**1,103,175**	**249,556**	

Table 9.2 Overview Targets and Funding of the NPP

9.6 Sector Breakdown of cash flow for the NPP

Description	US$	2003	2004	2005	2006	2007	2008	2009	2010
Investment Projects - CFC 113 Solvents	972,000	97,200	874,800						
Investment Projects – Foam (all sub-sectors)	4,997,546	100,000	973,553	1,030,159	1,223,082	1,102,192	568,559		
IFTAP Training Project/Workshop - Foam	388,500		150,982	62,355	74,033	66,715	34,415		
Investment Projects - Refrigeration Manufacturing/Assembly	2,788,000	252,516	2,066,124	469,360					
REFTAP Training Project - Refrigeration Assembly	487,100	263,266	223,834						
Investment Project – MAC R&R Project	2,485,900	248,590	1,242,950		994,360				
MACTAP Training Projects - MAC	1,088,339		152,370	234,289	267,343	209,275	149,817	75,245	
Domestic & Commercial Refrigeration R&R project	1,673,800	193,318	643,582	836,900					
Domestic & Commercial Refrigeration - Technician Training Project	472,000	128,682	114,721	98,867	66,224	36,179	27,328		
Custom Training	229,200		229,200						
Project Implementation & Monitoring Unit	343,000	85,750	85,750		102,900		68,600		
Regulation and Policy Support	213,000	213,000							

Table 9.3 Cash-Flow for the National CFC Phase-Out Plan for Iran

9.7 Phase Out Targets and Annual Reductions

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Domestic/Commercial Serviving(RMP)				129.5	115.5	99.5	66.6	36.4	27.5		475.0
Refrigeration Assembly/Manufacturing				120.8	101.0	44.9					266.8
Foam Sector Plan				123.7	118.7	140.9	127.0	65.5			575.8
MAC sector				45.6	70.2	80.1	62.7	44.9	22.5		326.0
Solvent Sector Plan				64.8							64.8
Subtotal				**484.4**	**405.4**	**365.4**	**256.3**	**146.8**	**50.1**		**1,708.4**
Expected impact of ongoing approved projects at the 38th meeting	151.1	116.0		1,120.0	988.0	73.0					2,448.1
Total CFC phase out targets/year	**151.1**	**116.0**		**1,604.4**	**1,393.4**	**438.4**	**256.3**	**146.8**	**50.1**		**4,156.5**

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Predicted annual reduction of eligible Consumption (by end of each year)	4,156.5	4,005.4	3,889.4	3,889.4	2,285.0	891.6	453.2	196.9	50.1	0.0
Maximum Consumption permitted by the Montreal Protocol (ODP tons)	4,571.0	4,571.0	4,571.0	4,571.0	2,285.0	2,285.0	685.0	685.0	685.0	

Table 9.4 NPP - Phase Out Targets

9.8 Overview Baseline Data of the NPP

	No of Projects	Approved by Subsector	Impact SubSector	Completed	Ongoing	Reporting 2000	Reporting 2001	Remaining fundable based on dec. 35/56	Remaining fundable cons. Based on reporting	Eligible consumption surveyed	Allocation of fundable consumption	Excess consumption (eligibility not cerified yet)**
TOTAL		**41,324,082**	**5217.0**	**2933.3**	**2283.7**	**4,156.5**	**4,264.2**	**1,708.4**	**1,887.5**	**2,016.4**	**1,708.4**	**721.5**
Refrigeration		**30,795,268**	**2703.6**	**1701.5**	**1002.1**	**2,626.5**	**2,594.1**	**1,491.7**	**1,592.0**	**1,313.2**	**1,067.8**	**684.1**
Manufacturing		30,656,668	2703.6	1701.5	1002.1	1,826.6	1,793.1	691.8	791.0	382.7	161.3	183.7
Domestic	29	16,155,995	1476.6	1129.0	347.6							
Commercial	45	11,850,062	1107.9	572.5	535.4							
Domestic/Commercial	9	1,490,463	119.1		119.1							
Assembly	0									105.5	105.5	
Compressor	1	1,160,148										
Dom/Com Servicing						449.9	475.0	449.9	475.0	475.0	475.0	275.0
MAC	1	138,600		(24) indirekt		350.0	326.0	350.0	326.0	350.0	326.0	225.4
								0.0	0.0			
Foam	**25**	**10,528,814**	**2513.4**	**1231.8**	**1281.6**	**1,520.0**	**1,515.1**	**206.7**	**233.5**	**638.4**	**575.8**	**37.4**
Rigid	9	3,801,136	1395.6	1231.8	163.8					218.9		
Moulded/Integral	6	2,078,648	185.3	0.0	185.3					193.8		
Flexible Slabstock	10	4,649,030	932.5	0.0	932.5					225.7		
Solvent						**10.0**	**62.0**	**10.0**	**62.0**	**64.8**	**64.8**	**0.0**
Aerosols (only MDI)							**93.0**			**93.0**		

* includes 1 Joint proposal of 5 projects IRA/FOA/17/INV/11

** eligibility under this columns may be disputed because, no CFCs used, documentation not provided in time, contact not established

***I is estimated that the actual eligible consumption in this sector is 575 for 2003. However, since there are no exact figures, the figure applied here is identical with the fundable consumption as derived from the reporting 2000. The remaining consumption is shown under excess consumption. A similar approach has been applied for domestic and commercial servicing.

Table 9.5 Consolidated Overview Sector History and remaining consumption,

9.9 Milestones and Planned Disbursement of Tranches

Milestone	Gross Performance Target*	Amount (US$)
December 2003	Approval of the NPP Start of preparatory work for implementation management, training and procurement activities	1,839,603
1st Tranche (2004)	Procurement in Foam and Refrigeration sector is ready to be started. Regulations will have developed for all sector and passed for approval	7,530,430
2nd Tranche (2005)	Iran will meet compliance of 2285 ODP T import Activities in Solvent sector completed. RMP and MAC activities largely implemented. Enforcement center will be established	3,142,087
3rd Tranche (2006)	Iran will phase out another 450 ODP T under the NPP apart from projected phase out of 988 ODP T from approved projects.	3,183,170
4th Tranche (2007)	Refrigeration Manufacturing activities completed Iran will meet compliance of 685 ODP T import ,	1,726,993
5th Tranche (2008)	Foam sector activities completed	1,103,175
6th Tranche (2009)	RMP and MAC activities completed	249,556
(2010)	Iran will have phased out all CFCs, final monitoring and problem solving if any	

Individual performance targets can be found in the sector activity descriptions

Table 9.6 Key Project Implementation Milestones

9.10 Monitoring schedule

Monitoring	Who is reponsible	Reports to	Times/year
Industry Sector phase out			
Refrigeration Manufacturing	UNDP/UNIDO	IMAF/NOU	4
Domestic/Commercial Servicing (RMP)	UNIDO	IMAF/NOU	4
Foam	Germany	IMAF/NOU	4
MAC service sector	France	IMAF/NOU	4
Solvent Sector	Japan/UNDP	IMAF/NOU	4
Import			
Import of CFCs	Customs department (CD)	IMAF/NOU	1
Sector breakdown	IMAF	IMAF/NOU	1
Regulations			
Legislative Council	NOU/UNEP	IMAF	1
Bureau of Standards	UNEP/NOU	IMAF	1
Quota	NOU/CD	IMAF	1
Overall implementation			
Consolidated project progress	IMAF/UNEP	MLF/EXCOM	1

IMAF=Implementation Management Facility

Table 9.7 Monitoring schedule

9.11 Role of the Implementing Agency

GTZ as the Lead IA will be responsible for a range of activities to be specified in the project document along the lines of the following: :

(a) ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country's phase-out plan;
(b) providing verification to the Executive Committee that the Targets have been met and associated annual activities have been completed as indicated in the annual implementation program
(c) assisting the Country in preparation of the Annual Implementation Program;
(d) ensuring that achievements in previous Annual Implementation Programs are reflected in future Annual Implementation Programs;
(e) reporting on the implementation of the Annual Implementation Program commencing with the Annual Implementation Program for the 2003 to be prepared and submitted in 2003;
(f) ensuring that technical reviews undertaken by the Lead IA are carried out by appropriate independent technical experts;
(g) carrying out required supervision missions;
(h) ensuring the presence of an operating mechanism to allow effective, transparent implementation of the Annual Implementation Program and accurate data reporting;
(i) verification for the Executive Committee that consumption of the Substances has been eliminated in accordance with the Targets;
(j) coordinate the activities of the Coordinating IAs, if any;
(k) ensuring that disbursements made to the Country are based on the use of the Indicators; and providing assistance with policy, management and technical support when required.

10 First Annual Action Program for the I.R of Iran for 2003

Country	**I.R. of Iran**
Year of plan	2003
Time period:	Dec 2003 – March 2004
No. of years completed	none
Target ODS consumption of the requested funding	only preparatory no reduction targets

Funding requests:	**US $**
Total grant	1,682,042
Total Support Costs	157,561
Total Costs to the MLF	**1,839,603**

Individual shares of the IAs	
GTZ funding	265,470
Support costs	29,202
Total GTZ	**294,672**
Cooperating agencies	
UNEP funding	213,000
Support costs	27,690
Total UNEP	**240,690**
UNIDO funding	490,984
Support costs	36,824
Total UNIDO	**527,808**
UNDP funding	415,397
Support costs	31,155
Total UNDP	**446,552**
France funding	161,584
Support costs	17,774
Total France	**179,358**
Japan funding	135,607
Support costs	14,917
Total Japan	**150,523**

10.1 Introduction

The requested funds are requested as an initial tranche for the implementation of the National Phase Out Plan of the I.R. Iran. The activities funded in 2003 are all used for preparatory action and to provide an infrastructure for immediate start of the main activities in March 2004, after approval of the annual plan 2004. Annual plans are to be submitted to the first meeting in a year, however since the approval of the National Plan will be in December 2003, this funding request will be exceptional in terms of time and form submitted.

Objectives of the initial funding in 2003 are:

A precondition for the necessary framework of the National Phase Out Plan is set:

- Implementation and enforcement of regulations and legislation has started
- Promotional campaigns inform private and public audience on the activities
- Project preparations for investments requests and procurement to be submitted in March 2004
- Initiate and prepare training activities
- Inform stakeholders and partners for implementations

Because of the preparatory nature of the requested funds there is no impact of ODS to documented. Therefore, an additional documentation of consumption history is not applicable for the proposed activities, since it is extensively documented in the NPP.

Below there is an overview of planned activities to be carried out

10.2 Legislative and policy action

- Improve existing ODS regulations to ensure compliance with the agreed calendar of CFC- phase out plan.
- Enhance the capacity of the government officers to target and capture ODS smugglers,
- Develop a database with information on illegal ODS trade activities in relation to the country
- Accurately register authorised import of CFC and CFC using equipment upon entrance to the country
- Report to the Ozone Secretariat conform Decision XIV/7, par 7 of MOP-14

The activity will be ongoing until 2008.
UNEP/NOU will be responsible for ensuring that this activity is completed in time to ensure the success of all the related activities necessary for Iran for achieving compliance.

10.3 Training of trainers and technicians (including MAC)

- Initiate the training of trainers as soon as the NPP is approved.
- Organise train the trainer workshops for March2004
- Work together with existing training partners and develop final operational plan .

First training of trainers to be completed by May 2004 .
First training of technicians to be started among large scale users in June 2004

10.4 Establish a reclaim network

- Contact all possible partners for the network and establish operational needs and schedules.
- Prepare procurement notices .
- Prepare Procurement to be started on approval of the next tranche

To be completed by early 2004.

10.5 Retrofits for the MAC and commercial refrigeration sub-sectors

- Guidelines for recovery and recycling to be developed
- A plan is to be developed on how the incentive program for encouraging the end users to retrofit, drop in can be promoted
- Develop supportive regulation
- Initiate the training of trainers as soon as the NPP is approved.
- Organise train the trainer workshops for March2004
- Work together with existing training partners and develop final operational plan .

10.6 Creation of a Network

- Industry which has indicated their interest to have such a network will be asked to come together.

- The NPP will only try and promote the concept of the association and assist with it initial costs.

10.7 Awareness

- Promote a start up program for the NPP in the public and private sector
- Assess relevant awareness /educational levels
- Prepare target group oriented communication strategy

10.8 Implementation and monitoring activities

- Establish infrastructure for the Implementation Management Facility
- Personnel recruitment
- Establish communication network among implementing partners
- Prepare and agree on reporting formats
- Develop regular schemes and schedules for monitoring
- Start monitoring activities
- Develop annual program for 2004