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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-eighth Meeting
Rome, 20-22 November 2002

PROJECT PROPOSALS: SYRIA

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

Foam

• Phasing out of CFC-12 by conversion to n-butane as a blowing agent in the manufacture of extruded polystyrene (EPS) foam for packing purposes at Shanko & Partners Co.	UNIDO

Refrigeration

• Sector phase-out plan for CFCs in the refrigeration (manufacturing) sector	UNDP

PROJECT EVALUATION SHEET
SYRIA

SECTOR: Foam ODS use in sector (2001): 295 ODP tonnes

Sub-sector cost-effectiveness thresholds: Polystyrene/polyethylene US $8.22/kg

Project Titles:

(a) Phasing out of CFC-12 by conversion to n-butane as a blowing agent in the manufacture of extruded polystyrene (EPS) foam for packing purposes at Shanko & Partners Co.

Project Data	**Polystyrene/polyethylene**
	Shanko
Enterprise consumption (ODP tonnes)	16.00
Project impact (ODP tonnes)	16.00
Project duration (months)	30
Initial amount requested (US $)	132,200
Final project cost (US $):	
Incremental capital cost (a)	305,100
Contingency cost (b)	10,000
Incremental operating cost (c)	-14,800
Total project cost (a+b+c)	300,300
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	132,200
Cost effectiveness (US $/kg.)	8.22
Counterpart funding confirmed?	
National coordinating agency	Ministry of Environment
Implementing agency	UNIDO

Secretariat's Recommendations	
Amount recommended (US $)	132,200
Project impact (ODP tonnes)	16.00
Cost effectiveness (US $/kg)	8.22
Implementing agency support cost (US $)	17,186
Total cost to Multilateral Fund (US $)	149,386

PROJECT DESCRIPTION

Sector background

CFC (Annex A Group I) Consumption and Phase-out Profile

According to Decision 35/57 Syria has selected Option 2 as starting point amounting to:	**485.2 ODP tonnes**
- Remaining consumption of CFCs eligible for funding as at 38th Meeting (per Decision 35/57, proviso B)	465.1 ODP tonnes
- Impact of ALL CFC projects submitted for funding at the 38th Meeting	313.0 ODP tonnes
- Maximum remaining consumption of CFCs eligible for funding following approval of projects submitted to 38th Meeting	152.1 ODP tonnes

Foam Sector Profile

- Consumption of CFCs in the foam sector in 2001*	295.0 ODP tonnes
- Amount of CFCs to be phased out in on-going foam projects	212.2 ODP tonnes
- Impact of foam projects submitted for funding at the 38th Meeting on remaining CFC consumption	16.0 ODP tonnes

* Based on data reported to the Fund Secretariat on 8 May 2002 by the Government of Syrian Arab Republic.

Extruded polystyrene foam

Phasing out CFC-12 by conversion to n-butane as blowing agent in the manufacture of extruded polystyrene foam for packaging purposes at Shanko and Partners

1. This project is a terminal project for the extruded polyethylene/polystyrene (EPE/EPS) foam sub-sector. Thus, with the approval of the project the EPE/EPS as well as the flexible foam sub-sector in Syria would have been completed.

2. Shanko and Partners operate one extrusion line installed in 1993 of installed capacity of 180 tonnes per annum. The average consumption of CFC-12 is reported to be 16 tonnes. The company will convert from the use of CFC-12 to n-butane. This requires some retrofit of the existing equipment and provision of facilities for fire prevention and occupational safety. The total incremental capital cost of the project is US $315,100. Incremental operational savings of US $14,800 are expected.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

3. The Fund Secretariat and UNIDO have discussed and agreed the cost of the project. The eligible grant consistent with the level of the company's CFC consumption was agreed as US $132,200.

RECOMMENDATIONS

4. The Fund Secretariat recommends:

(a) Blanket approval of the Shanko & Partners project with level of funding and associated implementing agency support cost indicated below;

(b) To note that the Government of Syria will not request further assistance from the Multilateral Fund for any project in the EPE/EPS foam sub-sector.

	Project Title	Project Funding (US$)	Support Cost (US$)	Implementing Agency
(a)	Phasing out of CFC-12 by conversion to n-butane as a blowing agent in the manufacture of extruded polystyrene (EPS) foam for packing purposes at Shanko & Partners Co.	132,200	17,186	UNIDO

PROJECT EVALUATION SHEET
SYRIA

SECTOR:	Refrigeration	ODS use in sector (2000):	3,125 ODP tonnes
Sub-sector cost-effectiveness thresholds:		Commercial	US $15.21/kg
		Domestic	US $13.76/kg

Project Titles:

(a) Sector phase-out plan for CFCs in the refrigeration (manufacturing) sector

Project Data	**Multiple-subsectors**
	Phase-out plan
Enterprise consumption (ODP tonnes)	578.00
Project impact (ODP tonnes)	297.00
Project duration (months)	48
Initial amount requested (US $)	4,095,581
Final project cost (US $):	
Incremental capital cost (a)	3,048,000
Contingency cost (b)	274,800
Incremental operating cost (c)	772,781
Total project cost (a+b+c)	4,095,581
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	4,095,581
Cost effectiveness (US $/kg.)	13.80
Counterpart funding confirmed?	
National coordinating agency	Ministry of State for Environmental Affairs
Implementing agency	UNDP

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

PROJECT DESCRIPTION

Sector background

CFC (Annex A Group I) Consumption and Phase-out Profile

According to Decision 35/57 Syria has selected Option 2 as starting point amounting to:	**485.2 ODP tonnes**
- Remaining consumption of CFCs eligible for funding as at 38th Meeting (per Decision 35/57, proviso B)	465.1 ODP tonnes
- Impact of all CFC projects submitted for funding at the 38th Meeting	313.0 ODP tonnes
- Maximum remaining consumption of CFCs eligible for funding following approval of projects submitted to 38th Meeting	152.1 ODP tonnes

Refrigeration Sector Profile

- Consumption of CFCs in the refrigeration sector in 2000*	986.0 ODP tonnes
- Amount of CFCs to be phased out in on-going refrigeration projects	387.0 ODP tonnes
- Impact of refrigeration projects submitted for funding at the 38th Meeting on remaining CFC consumption	297.0 ODP tonnes

* Based on data reported to the Fund Secretariat on8 may 2002 by the Government of the Syrian Arab Republic.

Sector Phase-out Plan for CFCs in the Refrigeration (Manufacturing) Sector

Structure and ODS consumption in the refrigeration sector

5. A full range of products from domestic refrigerators to industrial refrigeration equipment is manufactured in the refrigeration sector in Syria. The sector is reported as having growth in the past decade of 3% to 5% annually.

6. In the domestic refrigeration sub-sector the large manufacturers and some medium-sized manufacturers have already been converted or are in the process of converting to CFC-free technology with the assistance of the Multilateral Fund. Some small- and medium-sized manufacturers have not yet been addressed.

7. The commercial refrigeration sub-sector is comprised of a large number of predominantly small and medium-sized enterprises which are characterized by low levels of investments in plant. Although general awareness about quality assurance, training, environment and safety-related issues exists, in practice, they do not receive much emphasis due to low levels of operating capital, because of the low scale of operation and the pressures on profitability exerted by the very competitive domestic market as well as cheap imports. Few enterprises in this sub-sector have received assistance from the Fund.

8. The baseline ODS consumption (average 1995 –1997) in the refrigeration sector is 775 ODP tonnes. The Executive Committee has approved 25 investment and technical assistance projects phasing out 837 ODP tonnes at the total amount about US $11.4 million. The 2001 ODS consumption in the refrigeration sector is reported to be 986 ODP tonnes including 578 ODP tonnes in the refrigeration manufacturing sub-sector.

9. The Government of Syria plans to address the remaining CFC consumption in the Refrigeration Sector through implementation of a Sector Phase-out Plan for the Refrigeration (Manufacturing) Sector. The residual CFC consumption in the Refrigeration (Servicing) Sector will be addressed as part of a National CFC Phase-out Strategy to be submitted in 2002/2003.

Survey results

10. At the request of the Government of Syria UNDP has conducted surveys of the Refrigeration (Manufacturing) Sector. A total of 78 enterprises engaged in manufacturing of refrigeration equipment have been identified with a CFC consumption of 312 ODP tonnes. 69 enterprises were established before July 25, 1995. The remaining were established after July 25, 1995, and would therefore not be eligible for funding. 55 are small-sized enterprises, with CFC consumption of less than 5 ODP tonnes/year. 14 of the 78 enterprises have negligible or no foaming operations in the baseline.

Choice of technology

11. All the enterprises will convert to HCFC-141b based systems for their foam operation as an interim technology to maintain product standards and acceptability, and to HFC-134a and R-404a for the refrigeration systems.

Implementation modality

12. The Sector Phase-out Plan for elimination of CFCs in the Refrigeration (Manufacturing) sector in Syria will be implemented through a combination of investment, technical support and policy & management support components. 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.

13. CFC phase-out in ineligible enterprises will not be funded under the sector phase-out plan and is expected to take place 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.

14. Three enterprises in the domestic refrigeration sub-sector will be implemented by UNIDO.

Components of the Plan and Requested costs

15. The investment component of the plan provides production equipment to all enterprises, including foaming machines and refrigerant charging units as well as resources for technical assistance, training and trials at a cost of US $3,022,800, including 10% contingency.

16. The non-investment component amounts to US $ 300,000, including the establishment of product and quality standards, technology workshops, and licensing/certification programme at a cost of US $110,000 and the policy and management support activities providing local support for the implementation of the project at a cost of US $190,000.

17. Incremental operating costs (IOC) for two years amounting to US $772,781 are claimed for higher cost of foam chemicals and refrigerant.

18. The cost-effectiveness of the proposal is US $13.80 kg ODP. The implementing agency support costs are calculated at the level of US $460,514 representing 11.2% of the amount of grant.

19. The overall management of the Plan will be carried out as described in Section 4.3, by the National Ozone Unit, Government of Syria. The implementation of the Plan will be carried out by UNDP, except for the 3 sub-projects in the domestic refrigeration sub-sector to be implemented by UNIDO.

Performance and disbursement schedule

20. The proposed performance and disbursement schedule is provided in the table below:

Year (As of 31 Dec)	ODS phase-out target (ODP tonnes)			Remaining Sub-sector ODS Consumption (ODP tonnes)	Disbursement (US$)
	From approved ongoing projects	From Sector Phase-out Plan	Total		
2002	0	0	0	578	2,000,000
2003	120	0	120	458	1,000,000
2004	120	100	220	238	750,000
2005	26	100	126	112	250,000
2006	0	112	112	0	95,581
2007	0	0	0	0	0
TOTAL	**266**	**312**	**578**	**0**	**4,095,581**

21. The Government of Syria, through UNDP, requests the Executive Committee to authorize disbursement of funding in advance for 2003, to initiate the implementation of the Plan. Since the average duration for completion of a sub-project is expected to be about 18 months, the phase-out activities initiated in 2003 will not produce results until mid or end-2004, contributing to the reduction of consumption starting in 2005. Therefore, the Government of Syria through UNDP, will request the disbursement of the 2004 funding at the last Meeting of

the Executive Committee held in 2003, against satisfactory reporting of activities carried out in 2003. The funds for 2005 and 2006 will be transferred to UNDP at the first meeting of the Executive Committee in these years, for the amounts listed in the table above, upon approval of the annual implementation plan and upon confirmation by Government and UNDP, that the agreed reduction targets and relevant performance milestones of the respective preceding years have been achieved.

Justification for the use of HCFC-141b

22. Justification for the use of HCFC-141b based on technological and economic analysis of each enterprise's operations is provided in the project document. UNDP indicated that the choice of HCFC-141b as interim technology was made by the enterprises following a discussion with them on available alternatives and relevant decisions of the Executive Committee regarding the use of HCFC-141b as interim substitute foam blowing agent.

23. In accordance with relevant decisions of the Executive Committee on the use of HCFCs, a letter of transmittal from the Government of Syria endorsing the use of HCFC-141b by the companies has been submitted and is attached.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

CFC consumption in the sector

24. The Secretariat has analysed CFC consumption data reported by the Government of Syria for 2000 and 2001. The total import of CFC-12 has slightly decreased (by 25 ODP tonnes) due to implementation of projects in the aerosol sector and reduction of CFC-12 consumption in the servicing sector. However, CFC-12 consumption in the refrigeration manufacturing sector has increased by 69 ODP tonnes or 52%. Total CFC-11 import has expanded by 237.5 ODP tonnes or 80%, which is associated with an increase in consumption in the foam and refrigeration manufacturing sectors.

25. CFC consumption in 2000 in the refrigeration manufacturing sub-sector was reported by the Government of Syria at the level of 305.52 ODP tonnes (309 ODP tonnes in 1999). Taking into account the CFC consumption in approved ongoing projects in the sector (266 ODP tonnes) the remaining eligible consumption would be 39.52 ODP tonnes. However, project impact of the proposal submitted is estimated at 297 ODP tonnes.

26. The 2001 CFC consumption in the same sub-sector is reported to be 578 ODP tonnes, an increase of 272.48 ODP tonnes. If consumption of 34 ODP tonnes phased out as a result of implementation of two projects in 2001 in the sector is taken into account, the actual increase would be 306.48 ODP tonnes or about 100%. Project proposals submitted within the last two years have consistently indicated that the average growth rate in the refrigeration sector in Syria has been relatively steady, following the real GDP growth of about 3-5%. In 2001, the growth rate of GDP in Syria was 3.5%. The Secretariat notes that major CFC users in the sector either

have already converted to non-CFC technologies or are in the process of conversion. Potentially, only production growth in the remaining small- and medium-sized manufacturers in the sector could cause such a significant growth in CFC consumption. However, these enterprises are characterised by modest levels of investments, training, technical knowledge and production equipment. It is very unlikely that enterprises with such a baseline could almost double their output within the span of a year resulting in the reported increase in CFC consumption. The existence of over 70 SMEs in the refrigeration sector has been referred to in project proposals since 1999. It appears that in 2001 CFC consumption data are not consistent with the earlier established pattern of consumption in end-user sectors in Syria.

Survey results

27. The proposal indicates that the bulk of the information regarding CFC consumption and baseline equipment was obtained through questionnaires collected by the Ozone Unit. Field trips were also organised for plant visits. A significant discrepancy is identified in the level of CFC-11 consumption between the years 2000 and 2001 in the refrigeration manufacturing sector. Small- and medium-sized enterprises covered by the survey predominantly use pre-blended polyol. Part of this pre-blended polyol might be imported from other non-Article 5 or Article 5 countries, such a situation is observed in some Article 5 countries. The origin of the blowing agent has to be identified, accounted for and not included in the actual CFC-11 consumption in the country. The project document does not provide those details.

28. No data are provided in relation to the level of production in terms of the numbers of units produced by each company. Only three companies out of 78 are categorised under the domestic refrigeration sub-sector. Additionally, all the remaining enterprises are classified under the commercial refrigeration sub-sector. Under Fund rules, the classification between commercial and domestic refrigeration sub-sectors is based on the size of compressors used. This information is, however, not available. The correct division between two sub-sector has a bearing on the duration of IOC and cost-effectiveness. None of 78 enterprises was categorised as belonging to the new transportation, assembly, installation and servicing refrigeration sector as defined by Decision 31/45. It was assumed in calculating incremental operating costs associated with increase in density that the distribution of products manufactured by all enterprises is equal among the five product classifications. In the absence of accurate data on the distribution of product, the presented classification of enterprises among the two sub-sectors (commercial and domestic) does not appear to be accurate. The review of projects approved by the Executive Committee in the refrigeration sector in Syria demonstrated that the product manufactured by almost all small- and medium-sized refrigeration enterprises represented a combination of different types of refrigeration equipment pertaining to different refrigeration sub-sectors. The availability of this information is crucial for the calculation of incremental operating costs and cost effectiveness in all approved projects. The Sector Plan does not therefore provide all the required information.

Incremental operating costs

29. The Submission by Syria is more accurately characterised as a terminal umbrella project. The Executive Committee has made provisions in Decision 25/50 for circumstances in which

there are significant number of small enterprises and detailed information on the structure of the refrigeration sector is not available. Taking into consideration unavailability of information on the classification of enterprises, the distribution of the products manufactured by them, and composition and origin of the pre-blended polyol used, Decision 25/50, in particular, part (d) (items from (i) to (v)), has been applied. It was determined that no incremental operating costs are eligible for funding in the Sector Plan for Syria.

Incremental capital cost

30. Decision 25/50/(d)(ii) stipulates that "the requirements for capital equipment should be determined by establishing the typical equipment needed for an enterprise representative of those remaining in the sector (equipment requirements will be modest and will generally be similar), and the estimated number of enterprises involved, taking into account the possibility of industrial rationalization". Decision 25/50 also provides guidance in regards to provision of technical assistance, trials and training. The Secretariat provided to UNDP specific proposals regarding unit cost of equipment to be applied in calculating total eligible incremental costs of capital equipment.

31. In regard to non-investment activities the technical support component of the sector, the Secretariat questioned the eligibility of the request for US $110,000 cost since the total of US $331,500 is allocated for technical assistance, training and trials under the investment component. Under policy and management support activities, the Secretariat recommended to combine training, capacity building and awareness activities and limit the number of workshops with subsequent reduction in the cost of the component.

32. The Secretariat is still discussing all the outstanding issues with UNDP. The Sub-Committee on Project Review will be informed accordingly.

RECOMMENDATIONS

33. Pending.

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY	SYRIA	**IMPLEMENTING AGENCY**	UNDP
PROJECT TITLE	Sector Phase-out Plan for CFCs in the Refrigeration (Manufacturing) Sector in Syria		
PROJECT IN CURRENT BUSINESS PLAN		Yes	
SECTOR		Refrigeration (Manufacturing)	
SUBSECTOR		All sub-sectors (except Servicing)	

ODS USE IN SECTOR	Baseline (Average of 1995-97)	775	MT ODP (Mfg + Svcg)
	Current (2001)	986	MT ODP (Mfg + Svcg)
	Current (2001)	578	MT ODP (Mfg)
	From approved ongoing projects	266	MT ODP
	From remaining non-eligible enterprises	24	MT ODP
	From remaining eligible enterprises	288	MT ODP
	Total	578	MT ODP
PROJECT IMPACT		**297**	**MT ODP**

PROJECT DURATION			4 years
PROJECT COSTS	Incremental Capital Costs	US$	3,048,000
	Contingencies (10%)	US$	274,800
	Incremental Operating Costs	US$	772,781
	Total Project Costs	US$	4,095,581
LOCAL OWNERSHIP			100%
EXPORT COMPONENT			0%
REQUESTED GRANT		US$	**4,095,581**
COST EFFECTIVENESS		US$/kg/y	13.80
IMPLEMENTING AGENCY SUPPORT COSTS		US$	460,514
TOTAL COST OF PROJECT TO MULTILATERAL FUND		US$	4,556,095
STATUS OF COUNTERPART FUNDING			N/A
PROJECT MONITORING MILESTONES			Included
NATIONAL COORDINATING BODY			National Ozone Unit, Ministry of State for Environmental Affairs

PROJECT SUMMARY

This project will phase out all the remaining CFC consumption in the Refrigeration (Manufacturing) Sector in Syria upon completion. The Sector Phase-out Plan will be implemented through four annual implementation programmes and together with the implementation of the approved ongoing projects, will result in the complete phase-out of CFCs in the Refrigeration (Manufacturing) Sector in Syria in four years. The Sector Phase-out Plan will cover the technology conversions in the 69 remaining eligible enterprises in the Refrigeration (Manufacturing) Sector and ensure timely, sustainable and cost-effective phase-out through a combination of investment, technical support and policy/management support components. The Refrigeration (Servicing) Sector is being addressed partly through the ongoing Refrigerant Management Plan and partly will be dealt with separately to cover any residual consumption. The total eligible incremental costs and the requested grant for the Refrigeration (Manufacturing) Sector Phase-out Plan are US$ 4,095,581.

IMPACT OF THE PROJECT ON THE COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS

The approval of this project will assist Syria in meeting its Montreal Protocol obligations, such as the phased reductions in ODS consumption as per the agreed schedules.

PREPARED BY	UNDP in consultation with NOU Syria	**DATE**	May/September 2002
REVIEWED BY	Dr. Hubert Creyf (Foams), Dr. Lambert Kuijpers (Refrigeration)	**DATE**	September 2002

PROJECT OF THE GOVERNMENT OF SYRIA
Sector Phase-out Plan for CFCs in the Refrigeration (Manufacturing) Sector in Syria

1. PROJECT OBJECTIVES

The objectives of this project are:

a) To ensure timely, sustainable and cost-effective CFC phase-out in the Refrigeration (Manufacturing) Sector, through development and implementation of a combination of investment, technical support and policy/management support components.
b) To enable Syria to meet its obligations of phased ODS reductions in accordance with the control schedule of the Montreal Protocol.
c) To achieve complete phase-out of CFCs in the Refrigeration (Manufacturing) Sector in Syria within four years.

2. INSTITUTIONAL FRAMEWORK

Syria ratified the Vienna Convention and the Montreal Protocol in December 1989. The preparation of the Country Programme incorporating the national strategy and action plan to phase out ODS in line with the Montreal Protocol control schedule, began in 1991. The Country Programme was approved in 1993. The Country Programme proposed measures and actions by the government and industry, such as institutional and regulatory measures, awareness and information dissemination, technical assistance, training and investments for technology conversions, for facilitating the phase-out of ODS in the various ODS consuming industry sectors and to assist them for complying with the country's commitments and priorities. The Country Programme targeted complete ODS phase-out by the year 2000.

The Country Programme Update initiated in 1995 with the assistance of UNIDO and the industry, renewed and reinforced Syria's commitment, strategy and action plan to eliminate ODS. The needs of CFC consuming industry sectors for compliance and conversion were reassessed through surveys. The updated Country Programme proposed the target date for complete CFC phase-out in 2002. Considering the needs of the industry, continued economic availability of CFCs and the overall economy in Syria, against the background of the new strategic planning frameworks and adjusted funding policies adopted by the Multilateral Fund, complete CFC phase-out is now targeted beginning 2007.

The activities related to ozone layer protection and implementation of the Montreal Protocol, are managed and coordinated through the National Ozone Unit, within the Ministry of State for Environmental Affairs.

To provide regulatory and policy support for enabling the industry to eliminate ODS, the Government of Syria takes the following initiatives and actions:

a) Establishing a licensing system for import of ODS from 1999.
b) Ban on imports of goods containing ODS from 1996.
c) Monitoring the use and import of ODS to control and prevent illegal trade and capacity building of customs officials through the ongoing Refrigerant Management Plan.
d) Active participation in the preparation, implementation and monitoring for projects funded by MLF
e) Formulating guidelines and regulations as necessary for policy implementation
f) Supporting public awareness initiatives and campaigns for promoting ozone layer protection at the consumer level for encouraging public involvement.
g) Regular interaction with other ministries and departments, industry representatives and implementing agencies for information dissemination related to impact of policy measures
h) Promoting research and use of ozone-friendly technologies.

3. SECTOR BACKGROUND

3.1 Background of the Refrigeration Sector

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, walk-in coolers and freezers, industrial refrigeration equipment such as cold storage and transport refrigeration units and commercial appliances such as mobile air conditioning units. The Refrigeration Sector in Syria 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.

3.2. Structure of the Refrigeration Sector

3.2.1 Supply Industry

There are no indigenous manufacturers of hermetic or semi-hermetic refrigeration compressors in Syria; hence the entire domestic demand of compressors for the domestic and commercial refrigeration sub-sectors is met through imports mainly from Europe and Asia. Refrigerants and the blowing agents are also not manufactured in Syria and the domestic requirements are met through imports from producers in Syria, China, Europe, etc. The chemicals required for producing the polyurethane foam insulation are also imported from developed countries and supplied through distributors, indenting agents and systems houses. 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.

3.2.2 User Industry

In the domestic refrigeration sub-sector, there are several manufacturers of household refrigerators and freezers. The large manufacturers and some medium-sized manufacturers have already converted or are in the process of converting to CFC-free technology with the assistance of MLF. There are a few small and medium-sized manufacturers, who are yet unaddressed.

In the commercial refrigeration sub-sector, there are a few medium-sized manufacturers, who have converted to or are in the process of converting to CFC-free technology with MLF assistance. This sub-sector comprises of a large number of predominantly small and medium-sized enterprises, which are geographically scattered and with relatively little access to sophisticated technology and practices. These enterprises are characterized by low levels of investments in plant and machinery and resulting labor-intensive operation. 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, because of 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.

3.3 History of ODS phase-out

The overall ODS consumption for all sectors in Syria, as reported by the Government of Syria is as tabulated below:

Table-1
Syria: Overall ODS Consumption (1995-97)

SECTOR	1995 (MT)	1996 (MT)	1997 (MT)	Average (ODS MT)	Average (ODP MT)
Aerosols	790.00	813.90	914.90	839.60	839.60
Foams	525.00	532.00	593.40	550.13	550.13
Refrigeration	992.00	854.10	479.40	775.17	775.17
Solvents	79.46	70.00	55.00	68.15	56.44
Halons	70.00	73.00	71.00	72.00	419.33
TOTAL					

The breakdown of CFC consumption in Syria as reported by them for the various CFC-consuming sectors for CY 2000 is tabulated below:

Table-2
Syria: CFC Consumption Data for CY 2001

Sector	Baseline Consumption (1995-97 Avg.) (ODP MT)	Consumption covered by approved projects (ODP MT)	Consumption from approved unimplemented projects (ODP MT)	Consumption for CY 2001 (ODP MT)
Aerosols	**840**	885	73	**75**
Foams	**550**	541	211	**295**
Refrigeration	**775**	837	387	**986**
TOTAL	**2,165**	**2,262**	**671**	**1,356**

The Refrigeration and Air Conditioning Sector in Syria accounts for about 36% of Syria's baseline CFC consumption. Since 1994, until December 2001, a total of 21 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-1. The summary of approved investment projects is as below:

Table-3
Syria Refrigeration Sector - Historical investment project approvals as of December 2001

Refrigeration Sub-Sector	Category of enterprises	Number of approved Projects	CFC Phase-out Target (ODP MT)	Approved Funding (US$)	Overall CE (US$/kg)
Domestic refrigeration	Large and medium	13	566	8,579,836	15.16
Commercial refrigeration	Small and medium	8	150	2,012,700	13.42
Total	**All**	**21**	**716**	**10,592,536**	**14.80**

The enterprises in the commercial refrigeration sub-sector were predominantly small and medium-sized, most of them with a CFC consumption of less than 20 MT/y. Only 2 out of the total 14 enterprises covered under the 8 projects had a baseline CFC consumption of more than 20 MT/y.

The Montreal Protocol programme in Syria has addressed primarily the domestic refrigeration sub-sector and to some extent the commercial refrigeration sub-sector. In addition to achieving the ODS phase-out targets, it has created a degree of awareness among the industry, of the need for incorporating environmental objectives in their investment and operational decisions. The technical assistance and training inputs received through the projects have also enhanced to some extent, the capacity at the enterprise level to address technical and environmental issues. However, the source of the remaining consumption in the Refrigeration (Manufacturing) sub-sector is by small and medium-sized enterprises characterized as described in the user industry structure (section 3.2.2) by modest levels of investments, training, technical knowledge base and awareness available to these enterprises. Moreover, the enterprises are scattered and difficult to access.

3.3.1 Historical Phase-out Approach

All the projects approved in this sector so far (with the exception of one project covering seven small commercial refrigeration enterprises) are individual projects. 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 infrastructural barriers, such as technology awareness, technical assistance, training, etc. due to the relatively limited amounts of resources approved for these activities, which are considered to be crucial in sustaining the viability of the enterprises and the CFC phase-out. A sector-wide phase-out approach therefore needs to be selected to address the remaining CFC consumption in this sector, addressing these concerns and considering that:

- That the Refrigeration (manufacturing) Sector has made only modest progress in CFC phase-out
- Only the phase-out of CFCs in new products in all remaining enterprises in this sector will primarily limit CFC use in this sector on a sustainable basis and provide the Government with the control and confidence needed to assure Syria's compliance with the Montreal Protocol control milestones

3.3.2 Historical Technology Choices

Five of the seven approved projects in the domestic refrigeration sub-sector selected cyclo-pentane technology for conversion of their foam operations. All remaining approved projects selected HCFC-141b based systems. The choices have been guided primarily by the scale of operations and costs. For the refrigerant operations, enterprises of all approved projects in the sector have chosen HFC-based technology, being the only cost-effective and viable technology available.

3.3.3 Current Status

The breakdown of CFC consumption in the Refrigeration Sector for CY 2001 is as below:

Table-4
Breakdown of the CFC consumption in the Refrigeration Sector for CY 2001

Substance	Refrigeration Manufacturing (ODP MT)	Refrigeration Servicing (ODP MT)	TOTAL (ODP MT)
CFC-11	202	5	207
CFC-12	369	403	772
Other CFCs	7	0	7
TOTAL	**578**	**408**	**986**

The Refrigeration (Manufacturing) Sector has a net unaddressed residual CFC consumption of 312 MT and the Refrigeration (Servicing) Sector has a net unaddressed residual CFC consumption of 288 MT.

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

Sector	Sub-sector	Status
Manufacturing	Domestic refrigeration	All the existing large manufacturers of domestic refrigerators have completed CFC phase-out with assistance from the Multilateral Fund. The few remaining medium-sized manufacturers will complete their CFC phase-out through ongoing projects and through the Sector Phase-out Plan
	Commercial Refrigeration	The enterprises in this sub-sector are predominantly small and medium-sized and scattered throughout the country. So far 14 enterprises have been covered under the Montreal Protocol programme. Most of the enterprises in this sub-sector remain to be addressed for CFC phase-out.
	Residential and commercial air conditioning	This sub-sector does not consume CFCs, but predominantly uses HCFCs and HCFC blends, mainly HCFC-22.
	MAC	There is no indigenous manufacturing activity of MAC equipment and therefore no CFC consumption in this sub-sector
	Chillers	There is no indigenous manufacturing capacity for central air conditioning centrifugal chillers in Syria.
Servicing	Domestic & commercial Refrigeration	Comprises of service establishments serving the existing population of domestic and commercial refrigeration appliances and equipment. The estimated number of such establishments is about 3,000. The ongoing RMP addresses part of the consumption in this sub-sector.
	Residential and commercial air conditioning	As noted above, this sub-sector does not have CFC consumption.
	MAC	The ongoing RMP addresses part of the consumption in this sub-sector
	Chillers	One approved project covering CFC reduction in servicing of central air conditioning chillers is being implemented under bilateral cooperation with France.

3.3.4 Future CFC phase-out Action Plan

The Government of Syria plans to address the remaining CFC consumption in the Refrigeration Sector as below:

- Sector Phase-out Plan for the Refrigeration (Manufacturing) Sector to be submitted for MLF approval in the 38th EC Meeting in November 2002.
- The residual CFC consumption in the Refrigeration (Servicing) Sector will be addressed as part of the National CFC Phase-out Strategy to be submitted in 2002/2003.

3.4 Survey of the Refrigeration Sector

With a view to address the CFC phase-out in the Refrigeration Sector through a sector-wide approach, the Government of Syria, through the Ozone Unit, requested UNDP to assist them in conducting surveys of the Refrigeration (Manufacturing) Sector. With the agreement of the Government, a local refrigeration consultancy firm was identified and retained. The firm and the Government of Syria jointly conducted the survey during January to May 2002. The survey and identification work covering enterprises in the Refrigeration (Manufacturing) sector was completed in May 2002 and the remaining CFC consuming enterprises in the Refrigeration (Manufacturing) Sector are now identified and their baseline information obtained.

3.4.1 Survey Methodology

The survey methodology for the refrigeration (manufacturing) sector comprised of the following steps:

- Interaction with upstream suppliers (of compressors, refrigerants, components, etc)
- Interaction with enterprises

Interaction with upstream suppliers was carried out through meetings and visits. Through these interactions, lists of enterprises were obtained. Additional inputs were obtained also through the lists maintained by consultant firm and by the Ozone Unit. Based on the lists obtained, interaction with enterprises in the Refrigeration (Manufacturing) Sector was carried out. Most of the enterprises surveyed were physically visited through field trips and plant visits carried out by the consultancy firm accompanied by representatives from the Ozone Unit. For the purpose of obtaining baseline information on the enterprises, a questionnaire developed by UNDP and the Ozone Unit was used. The CFC consumption figures obtained through the survey were verified at the enterprise levels through procurement records and were then correlated with the records of sales from distributors and traders and with the relevant government departments through the Ozone Unit to the extent available.

3.4.2 Survey Results

A total of 78 enterprises engaged in manufacturing refrigeration equipment were identified. Most of these enterprises were located in and around major industrial and commercial centers, such as Damascus, Homs, Hama, Aleppo, etc. The total CFC consumption in the 78 identified enterprises for CY 2001, is estimated at 312 MT.

3.4.3 Eligibility and Classification

The eligibility of the surveyed enterprises was determined in accordance with the relevant Executive Committee decisions. Of the total 78 enterprises, 69 enterprises were established before July 25, 1995. The remaining were established after July 25, 1995, and would therefore not be eligible for funding by MLF.

Out of the 78 enterprises, 55 fall into the category of small-sized enterprises, with a CFC consumption of less than 5 MT/y. The remaining 23 are considered medium-sized with a CFC consumption of over 5 MT/y. All enterprises are 100% indigenously owned and reported no exports to non-Article-5 countries.

Table-1 below provides a summary of the overall residual CFC consumption in the Refrigeration (Manufacturing) Sector in Syria:

Table-5
Syria - Residual CFC Consumption in Refrigeration (Manufacturing) Sector

Sub-Sector	Total number of enterprises identified	Number of eligible enterprises	ODS (MT)	Number of non-eligible enterprises	ODS (MT)
Domestic Refrigeration	4	3	54	1	8
Commercial/Industrial Refrigeration	74	66	234	8	16
Total	**78**	**69**	**288**	**9**	**24**

Table-6 below provides a summary of the classification of the eligible enterprises identified, based on their size (small enterprises with a CFC consumption less than 5 MT and medium-sized enterprises with a CFC consumption of more than 5 MT):

Table-6
Syria - Classification of remaining eligible enterprises in Refrigeration (manufacturing)

Sub-Sector	Number of eligible enterprises	Number of small-sized enterprises	ODS (MT)	Number of medium-sized enterprises	ODS (MT)
Domestic Refrigeration	3	0	0	3	54
Commercial/Industrial Refrigeration	66	47	85	19	149
Total	**69**	**47**	**85**	**22**	**203**

3.4.4 Products manufactured

The surveyed enterprises in the domestic refrigeration sub-sector manufacture household refrigerators and freezers and are generally better organized.

The enterprises in the commercial and industrial refrigeration sub-sectors typically manufacture 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 process refrigeration systems, supermarket refrigeration systems and equipment, walk-in coolers/freezers, cold rooms, etc

Out of 78, 64 enterprises consume CFC-11 used as blowing agent for the rigid foam insulation. The remaining 14 enterprises have negligible or no foaming operations in the baseline.

3.4.5 Baseline Equipment

Based on the responses to the questionnaires, as well as the inputs received from plant visits, the baseline equipment for the foam and refrigeration operations in the enterprises can be summarized as below:

Foaming: Medium-sized enterprises mostly use locally made (or in some cases imported) foam machines. Small-sized enterprises predominantly use manual mixing of chemicals.

Refrigeration: Medium-sized enterprises typically have semi-automatic charging units, vacuum pumps and leak detectors suited for CFC-12. Small-sized enterprises mostly have assorted charging kits and vacuum pumps, suited for CFC-12.

3.4.6 Baseline Resources

While the owners/management of the enterprises surveyed, are more or less conversant with the need to eliminate CFCs under the Montreal Protocol, most enterprises do not have the financial or technical resources to undertake conversions at their own cost. Most of the small-sized enterprises have less than 10 employees. The medium-sized enterprises employ more than 10 persons. While the technicians have basic skills in refrigeration charging and evacuation, there is a lack of good housekeeping and related practices and lack of adequate knowledge or training on CFC-free technologies or applications. Most of the small-sized enterprises do not have well-equipped factories or workshops and lack organizational and infrastructural facilities.

3.4.7 Summary

The following table summarizes the breakdown of the remaining CFC consumption in the Refrigeration (Manufacturing) Sector:

Table-7

Syria Refrigeration (Manufacturing) Sector – Summary of remaining unfunded CFC users/consumption

Sub-sector/Category	Number of Enterprises	CFC Consumption (MT)
Eligible enterprises		
Medium-sized enterprises (CFCs ≥ 5 MT/y)	22	197.63
Small-sized enterprises (CFCs < 5 MT/y)	33	73.72
Small-sized enterprises (CFCs < 5 MT/y without foaming baseline)	14	16.47
TOTAL	**69**	**287.82**
Ineligible enterprises	**9**	**24.15**
GRAND TOTAL	**78**	**311.97**

A list of all the remaining enterprises in the Refrigeration (Manufacturing) Sector, with their brief baseline information is presented in Annex-2.

4. PROJECT DESCRIPTION

The Sector Phase-out Plan for elimination of CFCs in the Refrigeration (Manufacturing) sector in Syria will be implemented through a combination of Investment, Technical support and Policy & management support components.

4.1 Investment Component

The investment component of the plan will focus on enabling the participant enterprises to physically eliminate CFCs from their production activities and would comprise of the following elements:

- Assessment of the technical requirements of conversion
- Determining the scope of international and local procurement
- Development of technical specifications and terms of reference for procurement
- Prequalification and short-listing of vendors
- International/local competitive bidding
- Techno-commercial evaluation of bids and vendor selection
- Procurement contracts
- Site preparation
- Customs clearance and delivery
- Installation and start-up
- Product and process trials
- Operator training
- Commissioning and phase-in of CFC-free production
- Destruction of baseline equipment

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 (CFC consumption more than 5 MT/y)

- Individual sub-projects covering 22 enterprises (of which 3 sub-projects for the medium-sized enterprises in the domestic refrigeration sub-sector will be implemented by UNIDO).

For small-sized enterprises (CFC consumption less than 5 MT/y)

- Four group sub-projects covering 47 enterprises

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. 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.

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.

4.1.1 Plant and process investments

Foam Operations

a) 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, activities under 4.1.2 will assist enterprises for safe handling of the chemicals.

b) The use of new formulations will lead to a marginal change in mixing ratios and increased viscosity leading to reduced flowability 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.

c) The HCFC-141b based foam will have an increased molded 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

a) Compressors suitable and optimized for HFC-134a/R-404a will be required. These will be available from existing suppliers.

b) 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 polyolester 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.

c) 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.

d) The existing leak detection is unsuitable for detecting HFC-134a/R-404a leakages; therefore suitable hand-held leak detectors will need to be provided.

4.1.2 Technical assistance

Technical assistance 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. Their specific responsibilities include:

a) Technical assistance for preparing specifications of equipment to be procured in the sub-project
b) Technical equipment bid evaluation from suppliers during the competitive bidding process
c) Technical guidance to the recipient enterprise during start-up with the new equipment and process
d) Resolving technical issues with the phase-in of the new equipment and processes
e) Technical evaluation of the results of production and product quality trials jointly with the recipient enterprise
f) Technical project commissioning including final technical inspection of equipment and process for establishing completion and compliance with project objectives such as the destruction of the baseline CFC-based equipment where applicable, verification of depletion of CFC stocks, and verifying that the non-CFC production process is in operation
g) Technical evaluation of enterprise reimbursement claims on equipment, raw materials, local works and other items and certification of the same
h) Technical clearance of project completion, so that the project assets can be handed over and the project closed.
i) Technical assistance for completion and other reporting requirements.

4.1.3 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.

4.1.4 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.

4.2 Technical Support Component

Since the Sector Phase-out Plan will address the entire Refrigeration (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 the Refrigeration (Manufacturing) Sector as a whole, for the following:

a) Establishment quality and performance standards for the CFC-free products and applications within the sector.
b) Interaction with the user industry for providing technology assistance for sustainability of CFC-free refrigeration applications, through technical workshops and meetings
c) Establishment of a training, certification and licensing program for refrigeration system production equipment operators and technicians, for sustaining the CFC-free technologies.

4.3 Policy & Management Support Component

The implementation of the Sector Phase-out Plan will need to be closely aligned and coordinated with the various policy, regulatory, fiscal, awareness and capacity-building actions the Government of Syria is taking and will need to take in future, in order to ensure that the implementation of the Sector Phase-out Plan is consistent with the Government priorities, such as promotion of indigenization and decentralized management. Further, in view of the annual performance-based targets needed to be achieved under the terms of the Sector Phase-out Plan, the implementation of the Plan would need to be closely and efficiently managed and will introduce additional coordinating, reporting and monitoring activities.

The Refrigeration (Manufacturing) Sector Phase-out Plan will be managed by the National Ozone Unit through a dedicated management unit, comprising of a coordinator to be designated by the Government and supported by representatives and experts from the implementing/executing agencies and the necessary support infrastructure. The Policy & Management Support component of the Sector Phase-out Plan will include the following activities pertaining to the Refrigeration, for the duration of the Plan:

a) Management and coordination of the Plan implementation with the various Government policy actions pertaining to the Refrigeration Sector
b) Establishment of a policy development and enforcement program, covering various legislative, regulatory, incentive, disincentive and punitive actions to enable the Government to acquire and exercise the required mandates in order to ensure compliance by the industry with the phase-out obligations.
c) Development and implementation of training, awareness and capacity-building activities for key government departments, legislators, decision-makers and other institutional stakeholders, to ensure a high-level commitment to the Plan objectives and obligations.
d) Awareness creation of the Phase-out Plan and the Government initiatives in the Sector among consumers and public, through workshops, media publicity and other information dissemination measures.
e) Preparation of annual implementation plans including determining the sequence of enterprise participation in the planned sub-projects.
f) Verification and certification of CFC phase-out in completed sub-projects within the Plan through plant visits and performance auditing.
g) Establishment and operation of a reporting system of usage of CFCs/substitutes by users
h) Reporting of implementation progress of the Plan for the annual performance-based disbursement.
i) Establishment and operation of a decentralized mechanism for monitoring and evaluation of Plan outputs, in association with provincial regulatory environmental bodies for ensuring sustainability.

5. TECHNOLOGY

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

a) Proven and reasonably mature technology
b) Cost-effective conversion.
c) Availability of the systems at favorable pricing.
d) Critical properties that have to obtained in the end product
e) Compliance with established (local and international) standards on safety and environment.

The technology selected would also need to be easily adaptable at the (generally small-sized) recipient enterprises, which predominantly would be participating in this project. The selection of the technology would also need to be consistent with the priorities of the Government and industry and to ensure sustainability of the technology in the long-term.

5.1 Foam Operation

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

CLASSIFICATION	LIQUID TECHNOLOGY	GASEOUS TECHNOLOGY
Low ODP technologies (Interim)	HCFC-141b, HCFC-141b + water	HCFCs (22, 142b, 22 + 142b/141b
Zero ODP technologies (Permanent)	Water, Pentanes (n, iso, cyclo) HFC-245fa, HFC-365mfc, HFC-365/227	HFCs (134a, 152a)

Interim Technologies

HCFC-22 (independently or in combination with HCFC-142b and more recently with HCFC-141b) based systems, due to the low boiling point of HCFC-22, cannot be supplied pre-blended and will require investments in full-fledged in-house blending facilities. HCFC-22 also has residual ODP.

HCFC-141b has a boiling point near ambient temperatures. HCFC-141b based systems are technically mature and commercially available. They also provide relatively the most acceptable insulation value and energy efficiency, and the lowest investment and operating costs vis-à-vis other options. No major changes in the auxiliary equipment/tooling in the production program, such as jig/mold redesign, are needed. However, HCFC-141b has residual ODP and is also an aggressive solvent.

Permanent Technologies

Pentane based (n-, iso-, cyclo) systems require extensive safety related provisions/investments due to their flammability. Due to safety considerations, the use of pre-blended systems is not viable and additional investments for in-house pre-mixing are required. Cyclopentane has miscibility limitations with polyols. The molded densities and insulation values are still inferior to those obtained with HCFC-141b. The advantages are their relatively lower operating costs; they are environmentally relatively safe (no ODP/GWP or health hazards) and constitute a permanent technology. Hydrocarbons are thus, the preferred conversion technology for large and organized users, where safety requirements can be complied with and investments can be economically justified. In the present scenario, since most of the enterprises are small or medium-sized, application of hydrocarbon-based systems is not considered feasible.

Gaseous HFCs have been used successfully but cannot been applied widely at the present time, due to cost and availability factors.

For water-based systems, the insulation values, density and commercial availability are unsatisfactory at present. However, these systems have acceptable processing characteristics and are expected to be mature and commercially viable in the near future, especially for applications where insulation values are not very critical. In addition, they are environmentally safe (zero ODP/GWP, no health or safety hazards) and constitute a permanent technology. Since in the current situation the rigid foam is for insulation applications, applying water-based technology is not considered feasible.

Chemical and systems suppliers and the appliance industry have extensively evaluated liquid HFC-based systems. Preliminary trials with non-optimized formulations indicate lower molded foam densities, insulation values comparable to HCFC-141b and no solvent action. On the whole, liquid HFCs are considered to be the only potential zero-ODP alternatives to hydrocarbons. HFC-245fa is expected to be commercially produced beginning the mid-2002. Another candidate, a non-flammable blend of HFC-365mfc and HFC-227, is also planned for commercial production in the second half of 2002. Provided that the commercial and availability considerations are addressed, these substances can be considered to be viable long-term substitutes.

Based on the above considerations, 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.

5.2 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 (1:1mixture 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.

5.3 Technology Selection

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

Sub-sector	CFC Consumption (MT)	Technology Selected
Foam operation	208	HCFC-141b + partial water-based systems
Refrigerant operation	104	HFC-134a/R-404a

5.4 Additional Justification for HCFC technology

The implementing agency experts prior to the preparation of this proposal appraised the prospective recipient participating enterprises and had detailed discussions with the technical and managerial personnel of the enterprises, regarding the choice of technology for replacing the existing CFC-based technology, under the project. The enterprises were briefed in detail about the following:

1. An overview of the available interim (low ODP) and permanent (zero ODP) replacement technologies.
2. The techno-economic impact of each technology on the products manufactured, and the processes and practices employed by them.
3. The possible implication of each technology, in terms of its known impact on environment, health and safety, such as ozone depleting potential, global warming potential, occupational health, fire and explosion hazards.
4. It was emphasized to them that HCFC technologies are interim in nature due to their residual ODP and therefore may continue to adversely affect the environment, though at a lower scale than CFCs.
5. It was further explained that HCFCs use may become restricted under present or future international conventions and may also need to be phased out at a future date, and any investments required for their phase-out and for conversion to safer technologies, may have to be borne by them.

The enterprises indicated their preference for selection of HCFC-141b based technology, in their rigid foam operation. The specific justifications offered by them are: Water-based systems were considered, but are unsuitable due to the unsatisfactory insulation values, density and other end-product properties, which will affect their competitiveness. They considered hydrocarbon-based systems unsuitable due to the following:

a) The fire, explosion and security hazard and compliance with local safety regulations involved in the storage and handling of hydrocarbons, in view of their flammability. In the present premises of these enterprises such compliance is not possible. At the present time, it would not be cost-effective or viable for them to relocate their manufacturing facilities to ensure such compliance.
b) Since hydrocarbons cannot be pre-mixed in polyols due to the safety hazard they present in transportation, additional investments on in-house premixing equipment will be required. Considering their low volume of production, such investments are not economically viable.
c) In view of safety considerations, additional and continuous monitoring of plant operations by statutory authorities will be needed. The plant operators will need additional retraining for safety practices. The insurance premiums will increase. This will add to the burden of recurring costs.

In view of the above, the enterprises selected HCFC-141b (+ partial water) based systems for their rigid foam operations as the conversion technology, which will ensure quick phase-out of most of the ODP, while maintaining products competitive and the properties at acceptable levels.

6. INCREMENTAL COSTS

6.1 Summary of incremental costs

The incremental capital and operating costs for the Phase-out Plan 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-3. The total costs worked out are as below:

Incremental Capital Costs:	US$ 3,048,000
Contingencies:	US$ 274,800
Incremental Operating Costs:	US$ 772,781
Total:	**US$ 4,095,581**

6.2 Economics

The incremental costs of the Plan are budgeted on the basis that the sector-wide phase-out approach will result in economies through adoption of cost-effective execution strategies and also through dynamics of the market forces, while providing the Government with the flexibility and the resources to align its policy and regulatory actions with the technical actions, for ensuring a timely, systematic and sustainable phase-out. Some of the salient provisions of the economies considered for calculating the incremental costs of the sector-wide approach as compared to the individual project-to-project approach are as below:

a) In the investment component, budgets for technical assistance, trials and training are reduced to reflect the savings in the group/sector-wide approach, based on prior agreements for similar projects.

b) Only those enterprises with significant or meaningful foaming baselines have been considered for supporting the foaming operations.

c) 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.

d) 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).

7. COST EFFECTIVENESS

The Cost Effectiveness (ratio of the total incremental costs to the net ODP phased out per year post-project) of this project works out to US$ 13.80/kg/y. This has been calculated from the net incremental project costs of US$ 4,095,581 and the total CFCs, reflecting the net ODP value (after deducting the residual ODS of HCFC-141b) amounting to 297 MT, to be phased out upon completion. Details are provided in Annex-4.

8. FINANCING

The total requested grant funding is **US$ 4,095,581.**

9. IMPLEMENTATION

9.1 Management

The overall management of the Plan will be carried out as described in Section 4.3, by National Ozone Unit, Government of Syria; the implementation of the Plan will be carried out by UNDP through execution arrangement with UNOPS. UNIDO will implement 3 sub-projects in the domestic refrigeration sub-sector.

The Ozone Unit within the purview of the Ministry of State for Environmental Affairs will be responsible for monitoring of the implementation of the Sector Phase-out Plan. The Ozone Unit will be responsible for tracking the promulgation and enforcement of policy/legislations and assist UNDP with the preparation of annual implementation plans and progress reports to the Executive Committee of MLF. National Ozone Unit in collaboration with UNDP would supervise Plan implementation activities and conduct an annual independent audit for verifying CFC consumption levels under this Plan, including spot checks and random visits.

9.2 Performance and Disbursement Schedule

Year (As of 31 Dec)	ODS phase-out target (MT)			Remaining Sector ODS Consumption (MT)	Disbursement (US$)
	From approved ongoing projects	From Sector Phase-out Plan	Total		
2002	0	0	0	578	2,000,000
2003	120	0	120	458	1,000,000
2004	120	100	220	238	750,000
2005	26	100	126	112	250,000
2006	0	112	112	0	95,581
2007	0	0	0	0	0
TOTAL	**266**	**312**	**578**	**0**	**4,095,581**

9.3 Funding Arrangements

Upon approval by MLF of the Phase-out Plan, the Government of Syria, through UNDP, requests the Executive Committee to authorize disbursement of funding in advance for 2003, the implementation plan for which, is as below:

a) Establishment of operational mechanism for management and monitoring of the Phase-out Plan.
b) Formulation of detailed terms of reference and work plans for various activities under the Technical Support and Policy & Management Support components
c) Establishment of an operational mechanism for participation in the Phase-out Plan and for obtaining phase-out commitments from enterprises.
d) Initiating CFC phase-out activities for the 22 medium-sized enterprises through individual sub-projects.
e) Selection of the small-sized enterprises for group projects
f) One workshop under the Technical Support Component for technology assistance to prospective participant enterprises in the sector.
g) One workshop for public awareness and information dissemination under the Policy and Management Support component.

Since the average duration for completion of a sub-project is expected to be about 18 months, the phase-out activities initiated in 2003 will not be produce results until mid or end-2004, contributing to the reduction of consumption starting 2005. Therefore, the Government of Syria through UNDP, will request the disbursement of the 2004 funding at the last Meeting of the Executive Committee in 2003, against satisfactory reporting of activities carried out in 2003. The funds for 2005 and 2006 will be transferred to UNDP at the first meeting of the Executive Committee in these years, for the amounts listed in the table above, upon approval of the annual implementation plan and upon confirmation by Government and UNDP, that the agreed reduction targets and relevant performance milestones of the respective preceding years have been achieved.

10. RESULTS

This project will eliminate the use of CFCs in the Refrigeration (manufacturing) Sector in Syria

ANNEXES

Annex-1: List of Approved Investment Projects in the Refrigeration Sector in Syria
Annex-2: List of Remaining Enterprises in the Refrigeration (Manufacturing) Sector in Syria
Annex-3: Incremental Costs
Annex-4: Cost-effectiveness Calculations
Annex-5: Environmental Assessment
Annex-6: Draft Agreement
Annex-7: Technical Reviews

ANNEX-1
Syria - Approved Investment Projects In The Refrigeration Sector
(As of December 2001)

Refrigeration (Manufacturing)

No	Agency	Title	Approval Date	ODP	Grant (US$)	C. E. (US$/kg)
1	UNIDO	Al-Hafez Refrigerator Factory	Jul-1994	106.7	2,883,277	27.02
2	UNIDO	Penguin (Syrian Batric Co.)	Dec-1994	82.3	1,719,900	20.90
3	UNIDO	Barada General Company	Dec-1994	108.9	989,650	9.09
4	UNIDO	Umbrella - Krayem	Nov-1995	89.0	1,071,575	12.04
5	UNDP	Ammar Industrial Establishment	Nov-1998	56.0	331,080	5.91
6	UNDP	Al-Waha Refrigerator Co.	Nov-1998	28.2	330,486	11.74
7	UNDP	El-Effendi Refrigerator Plant	Nov-1998	13.3	182,802	13.74
8	UNIDO	Golden Penguin Co.	Jul-1999	18.4	247,481	13.45
9	UNDP	Al-Ihsan Co.	Jul-1999	37.4	497,250	13.28
10	UNIDO	Alaman Co.	Jul-1999	15.9	215,910	13.58
11	France	Sarkisian Refrigerators	Nov-1999	3.8	57,783	15.21
12	UNDP	Group Project (7 enterprises)	Nov-1999	51.9	743,419	14.31
13	France	Shoukairi and Co.	Nov-1999	2.5	33,359	13.34
14	France	Bashar Refrigerators	Nov-1999	3.2	49,113	15.21
15	UNDP	Al-Wattar Home Appliances Co.	Jul-2000	18.9	235,860	12.51
16	UNDP	Assalam Refrigerator Co.	Jul-2000	10.8	144,309	13.37
17	UNDP	Alfa Refrigerators Co.	Jul-2000	8.7	114,461	13.14
18	UNDP	Dolphin Refrigerators	Jul-2000	8.3	113,045	13.54
19	UNDP	Al-Raed Refrigeration	Dec-2000	13.9	211,800	15.24
20	UNDP	Refrigeration House Co.	Jul-2001	17.6	253,653	14.45
21	UNDP	Al-Saad Refrigeration	Dec-2001	20.1	166,323	8.27
TOTAL				**715.8**	**10,592,536**	**14.80**

Refrigeration (Servicing)

No	Agency	Title	Approval Date	ODP	Grant (US$)	C. E. (US$/kg)
1	France	CFC emission reduction in CAC	Nov-1999	0.9	143,000	158.89
2	FRG/UNEP	RMP	Mar-2000	120.0	742,146	6.18
				120.9	**885,146**	**7.32**

ANNEX-2
Syria - Indicative List of Remaining Enterprises in the Refrigeration (Mfg) Sector

Group I: Enterprises with CFC consumption > 5 MT/y

No	Name	Location	Sub-sector	CFC Consumption (MT/y)			Baseline Equipment	
				CFC-11	CFC-12	Total	Foam	Refrigeration
1	Al Madina	Damascus	CR/IR	8.00	2.70	10.70	HM	1 MCK, 2 VP, 1 LD
2	Abed Al Salam Zaror	Homs	CR/IR	7.65	2.35	10.00	LPD	1 SACU, 4 VP, 1 LD
3	Ahmad Al Halabe	Damascus	CR/IR	3.50	2.20	5.70	LPD	1 MCK, 2 VP, 1 LD
4	Al Basha	Aleppo	CR/IR	3.35	1.90	5.25	HM	1 MCK, 2 VP, 1 LD
5	Al Boushy	Damascus	CR/IR	3.40	1.75	5.15	LPD	1 MCK, 3 VP, 1 LD
6	Al Hafez	Aleppo	CR/IR	3.60	2.00	5.60	LPD	1 MCK, 2 VP, 1 LD
7	Al Kamal	Aleppo	DR	3.50	2.30	5.80	HM	1 MCK, 2 VP, 1 LD
8	Al Maleek	Aleppo	DR	33.73	6.07	39.80	LPD	2 ACU, 7 VP, 2 LD
9	Al Mimas	Homs	CR/IR	3.80	1.30	5.10	LPD	1 MCK, 2 VP, 1 LD
10	Al Neser Al Zahaby	Aleppo	CR/IR	6.50	4.50	11.00	LPD	1 SACU, 4 VP, 2 LD
11	Al Shabaa	Aleppo	CR/IR	3.80	2.10	5.90	LPD	1 MCK, 2 VP, 1 LD
12	Al Sheria	Aleppo	CR/IR	3.85	1.90	5.75	HM	1 MCK, 3 VP, 1 LD
13	Al Taoos	Aleppo	CR/IR	4.00	2.50	6.50	LPD	1 MCK, 2 VP, 1 LD
14	Asia	Aleppo	CR/IR	3.90	1.75	5.65	LPD	1 MCK, 2 VP, 1 LD
15	Atlaas	Aleppo	CR/IR	5.80	1.60	7.40	LPD	1 MCK, 2 VP, 1 LD
16	Mdouar	Damascus	CR/IR	3.20	2.50	5.70	LPD	1 MCK, 2 VP, 1 LD
17	Sakeer	Aleppo	CR/IR	5.20	1.80	7.00	HM	1 MCK, 2 VP, 1 LD
18	Saleem Taki	Hama	CR/IR	7.00	3.50	10.50	LPD	1 SACU, 4 VP, 2 LD
19	Soltan	Aleppo	CR/IR	3.70	1.80	5.50	HM	1 MCK, 2 VP, 1 LD
20	White Life	Aleppo	DR	7.00	1.46	8.46	LPD	1 SACU, 4 VP, 1 LD
21	Wodian	Aleppo	CR/IR	13.30	6.37	19.67	LPD	1 ACU, 4 VP, 2 LD
22	Younes	Aleppo	CR/IR	3.50	2.00	5.50	HM	1 MCK, 2 VP, 1 LD
Total (22 enterprises)				**141.28**	**56.35**	**197.63**		

Group II: Enterprises with CFC consumption < 5 MT/y (with foaming baseline)

No	Name	Location	Sub-sector	CFC Consumption (MT/y)			Baseline Equipment	
				CFC-11	CFC-12	Total	Foam	Refrigeration
1	Al Aman	Der Al Zor	CR/IR	0.78	0.32	1.10	HM	Assorted MCK, VP, LD
2	Al Aasi	Homs	CR	2.20	1.10	3.30	HM	
3	Al Asaad	Der Al Zor	CR	1.25	0.35	1.60	HM	
4	Al Bader	Damascus	CR	1.50	0.50	2.00	HM	
5	Al Forat	Der Al Zor	CR	1.45	0.30	1.75	HM	
6	Al Hakeem	Homs	CR/IR	1.60	0.75	2.35	HM	
7	Al Hejeal	Damascus	CR/IR	1.50	0.75	2.25	HM	
8	Al Homsi	Damascus	CR	1.10	0.40	1.50	HM	
9	Al Kendi	Aleppo	CR	3.35	0.49	3.84	HM	
10	Al Manara	Homs	CR/IR	1.30	0.90	2.20	HM	
11	Al Peno	Aleppo	CR	2.15	0.65	2.80	HM	
12	Al Safwa	Homs	CR	2.10	1.20	3.30	HM	
13	Al Shamout Al Doaly	Damascus	CR/IR	1.60	1.10	2.70	HM	
14	Al Shark	Damascus	CR	1.05	0.35	1.40	HM	
15	Al Zaiat	Aleppo	CR	1.30	0.13	1.43	HM	

Annex-2: Indicative List of Remaining Enterprises in the Refrigeration Sector (Cont'd)

Group II: Enterprises with CFC consumption < 5 MT/y (with foaming baseline) – Cont'd

No	Name	Location	Sub-sector	CFC Consumption (MT/y)			Baseline Equipment	
				CFC-11	CFC-12	Total	Foam	Refrigeration
16	Baashar Madour	Damascus	CR/IR	1.20	2.00	3.20	HM	Assorted MCK, VP, LD
17	Brens	Aleppo	CR	0.80	0.30	1.10	HM	
18	Dada	Damascus	CR	1.75	0.65	2.40	HM	
19	Elaf	Aleppo	CR/IR	1.00	0.75	1.75	HM	
20	Fadi	Homs	CR/IR	1.90	1.00	2.90	HM	
21	Farah	Aleppo	CR	2.73	0.62	3.35	HM	
22	Ghaleeb Shokery	Damascus	CR/IR	1.80	0.50	2.30	HM	
23	Ghassan	Al Kameshly	CR/IR	2.00	1.50	3.50	HM	
24	Hosian Taha	Der Al Zor	CR	1.20	0.50	1.70	HM	
25	Keeshy	Homs	CR	1.50	0.50	2.00	HM	
26	Kosa	Aleppo	CR	1.45	0.60	2.05	HM	
27	M. Haitham Boka'I	Damascus	CR	1.10	0.40	1.50	HM	
28	Maes	Aleppo	CR/IR	1.50	1.00	2.50	HM	
29	Maria	Aleppo	CR/IR	0.93	0.30	1.23	HM	
30	Redha Bilany	Damascus	CR/IR	1.15	0.85	2.00	HM	
31	Sasec	Aleppo	CR/IR	0.96	0.58	1.54	HM	
32	Shahed	Al Raaka	CR	1.30	0.40	1.70	HM	
33	Zanobia	Damascus	CR/IR	2.00	1.50	3.50	HM	
Total (33 enterprises)				**50.49**	**23.23**	**73.72**		

Group III: Enterprises with CFC consumption < 5 MT/y (without foaming baseline)

No	Name	Location	Sub-sector	CFC Consumption (MT/y)			Baseline Equipment	
				CFC-11	CFC-12	Total	Foam	Refrigeration
1	Aarfan Al Bodairi	Damascus	CR/IR	0.00	1.30	1.30	N/A	Assorted MCK, VP, LD
2	Al Amira	Aleppo	CR/IR	0.00	1.20	1.20	N/A	
3	Al Basha	Damascus	CR/IR	0.00	1.17	1.17	N/A	
4	Al Karmel	Damascus	CR/IR	0.00	0.75	0.75	N/A	
5	Al Kenz	Aleppo	CR/IR	0.00	1.68	1.68	N/A	
6	Al Sawwas	Aleppo	CR/IR	0.00	0.80	0.80	N/A	
7	Al Sharek	Aleppo	CR/IR	0.00	0.79	0.79	N/A	
8	Al Wared	Aleppo	CR/IR	0.00	1.19	1.19	N/A	
9	Al Zeen	Aleppo	CR/IR	0.00	1.80	1.80	N/A	
10	Asia	Aleppo	CR/IR	0.00	0.85	0.85	N/A	
11	Kalmejian	Aleppo	CR/IR	0.00	1.50	1.50	N/A	
12	Khaled	Homs	CR/IR	0.00	1.20	1.20	N/A	
13	Somar	Aleppo	CR/IR	0.00	0.95	0.95	N/A	
14	Zena	Aleppo	CR/IR	0.00	1.30	1.30	N/A	
Total (14 enterprises)				**0.00**	**16.47**	**16.47**		

Group IV: Ineligible Enterprises

No	Name	Location	Sub-sector	CFC Consumption (MT/y)			Baseline Equipment	
				CFC-11	CFC-12	Total	Foam	Refrigeration
1	Al Aaraby	Aleppo	CR/IR	0.00	0.95	0.95	N/A	Assorted MCK, VP, LD
2	Al Fajeer	Aleppo	CR/IR	2.91	0.62	3.53	HM	
3	Al Reabal	Al Sweda	CR/IR	0.00	0.83	0.83	N/A	
4	Al Sho'aa	Damascus	CR	2.45	0.72	3.17	LPD	1 SACU, 2 VP, 1 LD
5	Al Sofara	Aleppo	CR/DR	6.85	1.10	7.95	LPD	1 SACU, 3 VP, 2 LD
6	Dema	Aleppo	CR/IR	1.10	1.07	2.17	HM	Assorted MCK, VP, LD
7	Omareen	Homs	CR/IR	0.85	0.65	1.50	HM	
8	Reem	Aleppo	CR/IR	1.20	0.95	2.15	HM	
9	Samah	Aleppo	CR/IR	1.20	0.70	1.90	HM	
Total (9 enterprises)				**16.56**	**7.59**	**24.15**		

Summary

Enterprise Size/Category	Indicative Number of Enterprises	CFC Consumption (MT/y)		
		CFC-11	CFC-12	Total
Medium-sized (CFCs ≥ 5 MT/y)	22	141.28	56.35	197.63
Small-sized (CFCs < 5 MT/y) with foaming	33	50.49	23.23	73.72
Small-sized (CFCs < 5 MT/y) without foaming	14	0.00	16.47	16.47
Ineligible enterprises	9	16.56	7.59	24.15
GRAND TOTAL	**78**	**208.33**	**103.64**	**311.97**

KEYS FOR TABLES:

DR: Domestic Refrigeration
CR: Commercial Refrigeration
IR: Industrial Refrigeration

HM: Hand-mixing
LPD: Low-pressure foam dispenser
HPD: High-pressure foam dispenser

MCK: Manual charging kits
SACU: Semi-automatic charging units
ACU: Automatic charging units
VP: Vacuum pumps
LD: Leak detectors

ANNEX-3
Incremental Costs

A. Incremental Capital Costs

Investment Component

Cost Head and Enterprise Type	Medium-sized enterprises (≥ 5 MT CFCs)			Small-sized enterprises (< 5 MT CFCs)		
	No foaming baseline	Hand-mixing baseline	Dispenser baseline	No foaming baseline	Hand-mixing baseline	Dispenser baseline
Foam Operation						
Foam dispenser	N/A	30,000	60,000	0	20,000	N/A
Trials	N/A	2,000	2,000	0	2,000	N/A
Technical assistance	N/A	2,000	2,000	0	2,000	N/A
Training	N/A	1,000	1,000	0	1,000	N/A
Sub-total (Foam)	N/A	**35,000**	**65,000**	**0**	**25,000**	N/A
Refrigerant Operation						
Charging units	N/A	4,000	4,000	2,000	2,000	N/A
Vacuum pumps	N/A	5,000	5,000	2,500	2,500	N/A
Leak detectors	N/A	2,000	2,000	1,000	1,000	N/A
Trials	N/A	1,000	1,000	1,000	1,000	N/A
Technical assistance	N/A	1,000	1,000	1,000	1,000	N/A
Training	N/A	500	500	500	500	N/A
Sub-total (Refrigeration)	N/A	**13,500**	**13,500**	**8,000**	**8,000**	N/A
Total (per enterprise)	N/A	**48,500**	**78,500**	**8,000**	**33,000**	N/A
Number of enterprises	N/A	**7**	**15**	**14**	**33**	N/A
TOTAL (all enterprises)	**0**	**339,500**	**1,177,500**	**112,000**	**1,089,000**	**0**
TOTAL (US$)						**2,718,000**
Extra costs	Automatic charging units for 3 domestic refrigeration enterprises (US$ 10,000 each)					30,000
Contingencies (10%)						274,800
GRAND TOTAL (US$)						**3,022,800**

Non-investment Component

Proposed (see notes)	300,000
TOTAL (US$)	**300,000**

Summary

Investment Component	3,022,800
Non-investment Component	300,000
TOTAL INCREMENTAL CAPITAL COSTS (US$)	**3,322,800**

B. Incremental Operating Costs

Incremental Operating Costs proposed (see notes)	772,781
TOTAL INCREMENTAL OPERATING COSTS (US$)	**772,781**

C. TOTAL COSTS

Incremental Capital Costs including Contingencies	3,322,800
Incremental Operating Costs	772,781
GRAND TOTAL INCREMENTAL COSTS (US$)	**4,095,581**

NOTES & CLARIFICATIONS

Incremental Capital Costs

Foam Operation

1. The following considerations are involved in calculating the budgets for foaming equipment.

Enterprise type	Baseline	Replacement	Cost (US$)	Funding (US$)	Remarks
Small-sized (≤ 5 MT)	No foaming	None	0	0	
	Hand-mixing	Medium-pressure 40 lit/min	30,000	20,000	33% contribution
	LPD	Medium-pressure 60 lit/min	45,000	45,000	0% contribution
Medium-sized (> 5 MT)	No foaming	None	0	0	
	Hand-mixing	Medium-pressure 60 lit/min	45,000	30,000	33% contribution
	LPD	High-pressure 60 lit/min	60,000	60,000	0% contribution

2. The budgets for trials, training and technical assistance (total TTT) for the foam operation are based on US$ 5,000 per enterprise with a foaming baseline.

Refrigerant operation

3. Regardless of the baseline, trolley-mounted semi-automatic portable charging units are proposed for all enterprises. One such charging unit is proposed for each small-sized enterprise and two units for each medium-sized enterprise.

4. Two vacuum pumps and two hand-held leak detectors are proposed for each medium-sized enterprise. One vacuum pump and one hand-held leak detector is proposed for each small-sized enterprise.

5. The budgets for trials, technical assistance and training for the refrigerant operation (total TTT) are based on US$ 2,500/enterprise

Incremental Operating Costs

Foam Operation

Item	Unit	Before Conversion (US$)			After Conversion (US$)			Net Incremental Cost (US$/yr)
		Qty	Rate	Amount	Qty	Rate	Amount	
Foam Chemicals	Kg	1,278,467	2.50	3,196,168	1,342,390	2.67	3,584,181	388,013
Subtotal				3,196,168			3,584,181	388,013
Less savings due to more efficient processing of chemicals (5%)								(179,209)
Incremental operating costs/year for foam operation								**208,804**
Incremental operating costs for foam operation (NPV for 2 years @10% annual discounting)								**363,319**

Refrigerant Operation

Item	Unit	Qty.	Price Differential between pre- and post conversion (US$/unit)	Modifying Factor (if applicable)	Net Incremental Cost (US$/yr)
Refrigerant	Kg	96,050	3.00	0.90	235,323
Incremental operating costs/year for refrigeration operation					**235,323**
Incremental operating costs for ref. operation (NPV for 2 years @10% annual discounting)					**409,462**

Total

Foam	363,319
Refrigeration	409,462
Total	**772,781**

Annex-3: Incremental Costs (Cont'd

Basis and Considerations

1. **Incremental operating costs claimed pertain only to the cost differentials between foam chemicals and refrigerants, as it is foreseen that these differentials would exist throughout the duration of the project due to continued economic availability.**
2. **Incremental operating costs are not claimed on account of cost differentials for other components, such as compressors, condensers, evaporators, capillaries or expansion devices, etc., as it is foreseen that these cost differentials may not apply throughout the duration of the project.**
3. The increased costs on account of molded foam density increases in rigid foam with HCFC-141b based systems with respect to CFC-11 based systems as calculated as recommended by OORG and adopted by Executive Committee Decision 31/35. In order to apply the density increases, the distribution of products manufactured by relative CFC consumption, is assumed to be equal among the five product classifications, namely, display cabinets, chest freezers, visi-coolers, vending machines and walk-in-coolers.
4. The net savings on account of more efficient handling of chemicals due to the introduction of a new high-pressure or medium-pressure foam dispensers are calculated at 5%.
5. The calculation of incremental operating costs is based on the following assumptions and chemical costs:

   Rigid foam
   - Cost of baseline CFC-based chemical system: US$ 2.50/kg (Baseline ratio - 100:43:143)
   - Cost of HCFC-141b based chemical system: US$ 2.67/kg (New ratio - 100:26:145)

   Refrigeration
   - Cost differential for refrigerant: US$ 3.00/kg

6. All amounts rounded off to the nearest US$ 1.00
7. The calculations exclude all taxes/duties and growth.

Non-investment activities

The breakdown of the budgets for the non-investment activities (over a 4-year period) is as below:

Component	Activity	Basis	Budget (US$)
Sector Technical Support	Quality and product standards	Technical consulting @ 75 man days	45,000
	Technology workshops	4 workshops	40,000
	Licensing/certification program	Legal/technical consulting @ 50 man days	25,000
Policy and Management Support	Management and monitoring	100 days/year for 4 years (400 man days)	40,000
	Policy development & enforcement	100 days/year for 4 years (400 man days)	40,000
	Training and capacity-building	4 workshops	40,000
	Awareness programmes	4 workshops and information dissemination	50,000
	Verification and certification	50 days/year for 4 years (200 man days)	20,000
Total			**300,000**

ANNEX-4
Cost-Effectiveness

A. ODP Impact of the Project

SUBSTANCE	ODP	CONSUMPTION (KG)	NET ODP KG
CFC-11	1.00	208,330	208,330
Substitute: HCFC-141b	0.11	138,887	15,278
CFC-12	1.00	103,640	103,640
Substitute: HFC-134a	0.00	93,276	0
Remaining ODP Consumption in the sector			**15,278**

B. Cost-effectiveness Calculation

PARAMETER/COST HEAD	UNIT	TOTAL
Total Project Costs		
A. Incremental Capital Costs	US$	3,048,000
B. Contingencies (10% of A)	US$	274,800
C. Incremental Operating Costs	US$	772,781
D. Total Project Costs (A + B + C)	US$	4,095,581
Adjustments to Project Costs		
E. Adjustment for non-Article-5 ownership	US$	0
F. Adjustment for export to non-Article-5	US$	0
G. Adjustment for technological upgrade	US$	0
Net Project Costs		
H. Net Project costs (D – [E + F + G])	US$	4,095,581
ODS Phase-out		
I. Total ODS phase-out	Kg	311,970
J. Net ODP phase-out	ODP Kg	296,692
Cost-effectiveness		
K. Cost-effectiveness (H/J)	US$/kg/y	13.80
Eligible MLF Funding	**US$**	**4,095,581**

ANNEX-5
ENVIRONMENTAL ASSESSMENT

HCFC-141b has an ODP of 0.11 and GWP of 630, which are considered acceptable for rigid polyurethane foam application. HCFC-141b is considered non-flammable as a liquid and moderately flammable as a gas (7.6% to 17.7% in air by volume), and is considered safe in applications where the exposure level is less than 500 ppm on a 8-hour time weighted average basis, which is marginally lower than the existing technology. The smog potential of HCFC-141b is about ten times that of CFC-11, although with an emission rate of only about 3% during production, this is not an issue. No changes in the current occupational safety practices are envisaged.

HFC-134a has zero ODP and GWP of 1,300. For this application, this is considered acceptable. HFC-134a is non-flammable, and has been extensively tested for toxicity, and is considered safe in applications where the exposure level is less than 1000 ppm on a 8-hour time weighted average basis, which is the same as that for CFC-12, the existing technology. Therefore no changes in the current occupational safety practices are envisaged in this project.

This project thus uses environmentally safe and acceptable technology

The enterprises participating in this project have obtained the necessary statutory environmental clearances for their present operations. Additional clearances if any, for implementing this project, will be obtained as and when required from the relevant competent authorities.

ANNEX-6
Draft Agreement

1. The Executive Committee approves in principle a total of US$ 4,095,581 in funding for the phased reduction and complete phase-out in of CFCs used in the Refrigeration (Manufacturing) Sector in Syria. This is the total funding that would be available to Syria from the Multilateral Fund for the complete elimination of CFC use in the Refrigeration (Manufacturing) Sector in Syria, by 31 December 2006. The agreed level of funding would be disbursed in installments as indicated in Table-1 and on the basis of the understanding set out in this agreement. By this agreement, Syria commits that it will eliminate its total CFC consumption in the Refrigeration (Manufacturing) Sector in accordance with the phase-out target and CFC consumption limits as indicated in Table-1 below:

Table-1
Disbursement Schedule and Control Targets for CFC Consumption and Phase-out in the Refrigeration (Manufacturing) Sector in Syria

Parameter	2002	2003	2004	2005	2006	2007	Total
Annual CFC Consumption limit in the Refrigeration (Mfg) Sector (ODP MT)	578	578	458	238	112	0	N/A
Annual CFC phase-out target in the Refrigeration (Mfg) Sector (ODP MT)	0	120	220	126	112	0	578
Annual Funding Disbursement Tranche (US$)	**2,000,000**	**1,000,000**	**750,000**	**250,000**	**95,581**	**0**	**4,095,581**
Agency Support Costs (US$)	224,963	112,482	84,361	28,120	10,588	0	460,514
Total cost to Multilateral Fund (US$)	**2,224,963**	**1,112,482**	**834,361**	**278,120**	**106,169**	**0**	**4,556,095**

2. The phase-out of CFCs achieved in the Refrigeration (Manufacturing) Sector in excess of the specified target for a given year will contribute to achievement of the phase-out targets in subsequent years.

3. The Executive Committee also agrees in principle that the funds for the implementation of the annual programme for any given year will be provided at the last meeting of the Executive Committee in the preceding year, in accordance with the disbursement schedule in Table-1, for the exact amount listed for that year and on the basis of the implementation programme for the year, subject to the performance requirements contained in this agreement. The Executive Committee will strive to ensure that funds are provided at its second meeting in the preceding year. The funding installments for 2004, 2005 and 2006 will be released subject to:

a) The confirmation that all agreed phase-out targets and consumption limits for the previous year have been achieved;

b) The verification that the activities planned for the previous year, were undertaken in accordance with the annual implementation programme.

4. The Government of Syria agrees to ensure accurate monitoring of the phase-out. The Government of Syria will provide regular reports, as required by its obligations under the Montreal Protocol and this Agreement. The consumption figures provided under this agreement will be consistent with Syria's reports to the Ozone Secretariat under Article 7 of the Montreal Protocol.

The Government of Syria also agrees to allow independent verification audits of the consumption targets in the Refrigeration (Manufacturing) Sector, as provided for in this agreement, and in addition, external evaluation as may be directed by the Executive Committee, to verify that annual CFC consumption levels correspond to those agreed and that the implementation of the Refrigeration (Manufacturing) Sector Phase-out Plan proceeds as scheduled and agreed in annual implementation programmes.

5. The Executive Committee agrees to provide Syria with flexibility in using the agreed funds to meet the consumption limits indicated in Table-1. The Executive Committee has the understanding that during implementation, as long as it is consistent with this Agreement, the funds provided to Syria pursuant to this Agreement may be used in the manner that Syria considers will achieve the smoothest possible CFC phase-out, consistent with operational procedures as agreed between Syria and UNDP in the Refrigeration (Manufacturing) Sector Phase-out Plan as revised and as indicated in the annual implementation programmes. In the Executive Committee's acknowledgement of the flexibility available to Syria in achieving a complete CFC phase-out in the Refrigeration (Manufacturing) Sector, it is understood that Syria is committing to provide the necessary level of resources as may be required for the implementation of the plan and for achieving the consumption limits indicated in Table-1 above.

6. The Government of Syria agrees that the funds being agreed in principle by the Executive Committee at its 38th Meeting for the complete phase-out of CFCs in the Refrigeration (Manufacturing) Sector are the total funding that will be available to Syria to enable its full compliance with the reduction and phase-out as agreed with the Executive Committee, and that no additional Multilateral Fund resources will be forthcoming for any related activities in the Refrigeration (Manufacturing) Sector. It is also understood that aside from the agency fees referred to in paragraph 8 below, the Government of Syria, the Multilateral Fund, and its Implementing Agencies, and bilateral donors will neither request nor provide further Multilateral Fund related funding for the accomplishment of the total phase-out of CFCs in the Refrigeration (Manufacturing) Sector in Syria.

7. The Government of Syria agrees that if the Executive Committee meets its obligations under this Agreement, but Syria does not meet the reduction requirements outlined in Table-1 and other requirements outlined in this Agreement, the Implementing Agency and the Multilateral Fund will withhold subsequent tranches of funding outlined in Table-1, until such time as the required reduction has been met. It is clearly understood that the fulfillment of this Agreement depends on the satisfactory performance by both the Government of Syria and the Executive Committee of their obligations. In addition, Syria understands that with respect to all calendar year targets beginning with 2004, the Multilateral Fund will reduce the subsequent tranches and therefore the total funding for Annex-A Group-I substances in the amount of US$ 11,200 per ODP MT of reductions in consumption not achieved in any year, unless the Executive Committee decides otherwise.

8. UNDP is the lead implementing Agency for the implementation of this Phase-out Plan, which will be completed by the end of 2006. A fee of 13% (for the first US$ 0.5 million) and 11% (for the amount in excess of US$ 0.5 million) is included in accordance the relevant Executive Committee Decisions as indicated in Table-1. As the main implementing agency, UNDP would be responsible for the following:

a) Ensuring performance and financial verification in accordance with specific UNDP procedures and requirements as specified in the Refrigeration (Manufacturing) Sector Phase-out Plan;

b) Reporting on the implementation of the annual implementation programmes to be included as part of each annual programme starting with the submission for the 2004 annual implementation programme prepared in 2003;

c) Providing verification to the Executive Committee that the control targets listed Table-1 and the associated activities have been met;

d) Ensuring that technical reviews undertaken by UNDP are undertaken by appropriate independent technical experts;

e) Assisting Syria in preparation of annual implementation programmes, which will incorporate achievements in previous annual programmes;

f) Carrying out required technical supervision missions;

g) Assisting the Government to establish an operating mechanism to enable effective, transparent implementation of the programme, and accurate data reporting;

h) Verifying to the Executive Committee that CFC consumption phase-out in the Refrigeration (Manufacturing) Sector has been completed based on the schedules listed in Table-1;

i) Ensuring that disbursements are made to Syria based on agreed performance targets in the project and provisions in this Agreement;

j) Providing assistance for policy, management and technical support for implementation of the Sector Phase-out Plan, as and when required.

9. The Government of Syria also commits through this Agreement, to permanently sustain the reductions indicated in Table-1.

Country: **SYRIA**
Firm: **Various**
Type: **Refrigeration (Manufacturing) Sector Plan**
Date: **September 2002**

RTU-UN/Pav-LK-20306-dl

Scope
The plan under review covers the conversion in Syria of the remaining CFC consumption in the manufacturing of all domestic and commercial refrigeration units (it excludes the servicing sector). Only the refrigeration part has been reviewed.

1. Project Objectives and Institutional Framework

No comments regarding this description. The (existing) legislation is adequately described.

2. Description of the Refrigeration Sector

The description of the background and the structure of the refrigeration sector are clear. 3.2.1 "Supply industry" and 3.2.2 "User industry" give a good overview. The ODP tonnes (and CE values) given in the tables 1-3 are clear. It is useful information to learn that the net refrigeration consumption for 2001 is 986 ODP tonnes (excluding servicing); a large amount of CFCs have already been addressed in approved projects. The conclusion is correct (from the figures given from the survey that are confirming) that a "net" consumption of 312 ODP tonnes (of the 578 tonnes consumption in refrigeration in 2001) still needs to be addressed via projects (or a sectoral plan for manufacturing), where a small portion is ineligible. Table 3 gives an adequate description of the historic project information, where the domestic and commercial sectors had a funding level of US$14.80/ODP kg.

The description of the historical approach (and technology choices) in phasing out as given in sections 3.3.1 and 3.3.2 does not raise questions. The current status as presented in section 3.3.3, particularly regarding the CFC phase-out is adequate. Chapter 3.4, sections 3.4.1, survey methodology, and 3.4.2, survey results, do not raise comments. Looking at non-eligibility and eligibility is correctly interpreted. Table 5 and 6 give brief descriptions of the companies concerned (small-sized and medium sized companies), which is supported by sections on "products manufactured", "baseline equipment", baseline resources" etc. Annex 2, which presents a list of the companies with baseline information, is in order.

3. Project Description

The plant and process investments material given here is identical to the material given in separate projects before. A brief explanation is given why vacuum pumps cannot be retrofitted (although the list does not really explain issues), which is acceptable. It can be assumed (although there may be exceptions) that the existing refrigerant charging kits are not suitable for HFCs. Under "refrigerant operation" part c it is mentioned "upsizing the condensers and reengineering evaporators and condensers, so as to ensure the levels of cleanliness....". The first is engineering for product performance, the second has to do with the manufacturing process. This needs to be corrected (as far as experience from comparable projects is concerned, this can easily be reworded or changed).

The technical assistance is the important issue. One can assist companies via national consultants and experts, but it should be emphasised that one needs to make provisions that the companies do not stick to the use of CFCs (if they are cheap and available); in fact the small companies are comparable to small servicing companies where the same issue plays an important role. This implies destruction of old equipment, national monitoring, and some kind of certification of the manufacturing people and the products. This is explicitly mentioned under "technical support component" point c "...sustaining the CFC free technologies". The important issue is the question "how can training and certification guarantee that the non-CFC operations become "sustainable". This is pertinent and is -as mentioned- addressed in section 4.2.

No comments to the management component description. This management could indeed be part of the system that guarantees that operations are CFC free, and one should attribute to this management component a clear reporting requirement on all kind of phenomena (verification of CFC phase-out, reporting system of CFCs and substitutes etc.).

4. Technology

The summary of the selection of the alternative technology for conversion is brief and adequate. The proposal gives a short overview of the refrigerant candidates for domestic/commercial refrigerators, i.e. HCF-134a, HFC-152a, propane and isobutane and their mixture (1:1). In fact, only, HFC-134a (R-404A) and isobutane are globally valid options for new equipment; it is acceptable that the proposal mentions that flammables are not suited for the SME operations considered here. The choice for HFC-134a (R-404A) is acceptable.

5. Environmental impact

The refrigerant HFC-134a (R-404A) proposed has no ODP and acceptable other environmental characteristics.

6. Project costs

The following to the project costs:
Incremental capital and operating costs and contingencies etc. amount to US$4.029 million, with a CE of 13.58/kg ODP. If this is compared to the cost effectiveness of historical approvals for medium or small commercial and domestic firms, being about US$14.80 (see Annex 1in the proposal), one can observe that the CE value in this proposal is almost 10% lower (mainly due to costs for foaming equipment).

No comments to Annex 1 and Annex 2.

Costs given per company for small and medium sized enterprises (US$8,000 and 13,000 per company for the refrigerant operation in Annex 3) are acceptable.

Costs for technical support are acceptable (it cannot be judged whether it should it be more than US$500 per day); the same applies to the policy component (it cannot be judged whether it should be US$100 per day).

The calculation of operational costs on the basis of the chemical only is acceptable. No comments to the cost effectiveness calculation.

7. Implementation time frame (disbursement schedule)

No comments. The draft agreement cannot be commented to.

8. Recommendation

The conversion project **is supported** where it concerns the entire project concept (for the refrigeration components) and the various elements.

Eindhoven, 02 09 17
Kuijpers, LJM

(1)

TECHNICAL REVIEW.

1.Country:

Syria.

2.Project Title:

Sector phase-out plan for CFCs in the refrigeration (manufacturing) sector in Syria.

3.(Sub)sector:

Refrigeration (manufacturing).

This review covers only the foam part.

4.CP-Relationship:

Syria ratified the Vienna Convention and the Montreal Protocol in 1989. The preparation of the relevant CP began in 1991, and was approved in 1993. It was adapted several times, and now complete phase-out is foreseen in 2007.

The national Ozone Unit within the Ministery of State for Environmental Affairs is leading the efforts in the ODS phase-out.

5.Technology:

In order to eliminate the remaining ODS in the refrigeration manufacturing sector, this project foresees a combination of investment, technical support, and policy and managing support components.

Under the first heading, and for the medium sized enterprises, individual subprojects covering 22 enterprises are foreseen.

The small enterprises count 4 group subprojects.

In all projects, CFC11 will be substituted with HCFC 141b. The justification is acceptable (as mentioned in 5.4) if it is considered as an interim step to a zero ODS solution (but this assurance was not found in the project text).

The technical changes, as explained under 4.1.1, and the technical assistance (as explained under 4.1.2, 4.1.3 resp 4.1.4) are acceptable.

The policy and management support component should foresee further information to the eligible companies as to inform them when a technically and economically zero ODS technology is available in Syria.

(2)

6.Environmental Impact:

HCFC 141b has an ODP and a GWP of 0.1(vs. 1.0 for CFC 11). The smog potential is about ten times greater than the one of CFC 11.

The emission legislation of Syria must be consulted. The workplace concentration must be monitored and kept below the legal value.

7.Project Costs:

The reviewer counts only 7 enterprises (instead of 8) having a hand-mix baseline, but 15 (instead of 14) companies with a dispenser baseline.

Concerning IOC, the reviewer does not see from where total quantity of foam chemicals of 1,278,467 kg is coming. How can it be controlled?

The unit prices for polyol, isocyanate and blowing agent are not mentioned, so that the baseline for the chemical systems cannot be checked. However, it must be said that the unit prices used (resp. $ 2.50 and $2.67/kg seem fair.

8.Implementation:

Can be accepted as presented.

9.Recommendation:

It is recommended to accept this project after discussion of the items mentioned.

Prepared by Hubert Creyf, UNDP Foam Sector Reviewer.

Date:092202.

(3)

Nandan Chirmulay
<nandan@erols.com>
23/09/2002 08:47

To: Hubert Creyf <creyf.hubert@recticel.com>
cc: Dominique Kayser <dominique.kayser@undp.org>
Subject: Re: Syria: Ref (Mfg) Sector Phase-out Plan - Technical Review of the Foam part

Dear Hubert:

Thank you for the review. I clarify the points in the review as below:

The reviewer counts only 7 enterprises (instead of 8) having a hand-mix baseline, but 15 (instead of 14) companies with a dispenser baseline.
I am rectifying this in the final version of the document, which I will do tonight, simultaneously while incorporating the inputs that I will receive from the Syrian Govt.

Concerning IOC, the reviewer does not see from where total quantity of foam chemicals of 1,278,467 kg is coming. How can it be controlled? In Annex-3, Page 24, of the document, under item 5, you will find that the baseline ratio with CFC-11 based systems, has been mentioned as 100:43:143. The total quantity of the chemicals consumed, based on the baseline consumption of CFC-11, is calculated using this ratio.

I trust that the above will address the points raised. If acceptable, I request you to kindly forward your signed review by fax to UNDP-MPU, New York for the attention of Dominique Kayser (Dominique: I will send you the revised final version after incoporating Khaled's comments if any, by Tuesday, 24 September morning your time).

Best regards
Nandan

At 05:14 PM 9/22/2002 +0200, you wrote:

Dear Nandan,
As promised, herewith my review.

With best regards,
Hubert

Agreed,
092302
H Creyf
H. CREYF