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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
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PROJECT PROPOSALS: SYRIA

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

Aerosol:

- Phase-out of CFC-11 and 12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Badran & Co. UNIDO
- Phase-out of CFC-12 in the manufacture of insecticides by conversion to hydrocarbon propellant at Cheikh Ghazal Insecticide Plant UNIDO
- Phase-out of CFC-11 and 12 in the manufacture of hair sprays by conversion to hydrocarbon propellant at Khadji & Zahka UNIDO
- Phase-out of CFC-12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Mahmoud Hamida UNIDO

Foam:

- Conversion from CFC-11 to HCFC-141b in the production of rigid foam panels at Bassam Baghdad UNIDO

Refrigeration:

- Conversion from CFC-11 to HCFC-141b technology and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Al-Raed Refrigeration

UNDP

PROJECT EVALUATION SHEET SYRIA

SECTOR: Aerosol ODS use in sector (1999): 73.1 ODP tonnes
Sub-sector cost-effectiveness thresholds: Filling plant US \$4.40/kg

Project Titles:

- (a) Phase-out of CFC-11 and 12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Badran & Co.
- (b) Phase-out of CFC-12 in the manufacture of insecticides by conversion to hydrocarbon propellant at Cheikh Ghazal Insecticide Plant
- (c) Phase-out of CFC-11 and 12 in the manufacture of hair sprays by conversion to hydrocarbon propellant at Khadji & Zahka
- (d) Phase-out of CFC-12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Mahmoud Hamida

Project Data	Filling plant			
	Badran	Cheikh Ghazal	Khadji & Zahka	Mahmoud Hamida
Enterprise consumption (ODP tonnes)	15.60	36.00	11.00	10.50
Project impact (ODP tonnes)	15.60	36.00	11.00	10.50
Project duration (months)	26	26	26	26
Initial amount requested (US \$)	68,640	107,379	48,400	46,200
Final project cost (US \$):				
Incremental capital cost (a)	84,000	110,550	140,500	84,000
Contingency cost (b)	8,400	11,055	14,050	8,400
Incremental operating cost (c)	-10,372	-34,252	-6,169	-7,524
Total project cost (a+b+c)	82,028	87,353	148,381	84,876
Local ownership (%)	100%	100%	100%	100%
Export component (%)	0%	0%	0%	0%
Amount requested (US \$)	68,640	87,298	48,400	46,200
Cost effectiveness (US \$/kg.)	4.40	2.42	4.40	4.40
Counterpart funding confirmed?	Yes	Yes	Yes	
National coordinating agency	General Commission for Environmental Affairs			
Implementing agency	UNIDO	UNIDO	UNIDO	UNIDO

Secretariat's Recommendations				
Amount recommended (US \$)	68,640	87,298	48,400	46,200
Project impact (ODP tonnes)	15.60	36.00	11.00	10.50
Cost effectiveness (US \$/kg)	4.40	2.42	4.40	4.40
Implementing agency support cost (US \$)	8,923	11,349	6,292	6,006
Total cost to Multilateral Fund (US \$)	77,563	98,647	54,692	52,206

PROJECT DESCRIPTION

- (a) Phase-out of CFC-11 and 12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Badran & Co.
- (b) Phase-out of CFC-12 in the manufacture of insecticides by conversion to hydrocarbon propellant at Cheikh Ghazal Insecticide Plant
- (c) Phase-out of CFC-11 and 12 in the manufacture of hair sprays by conversion to hydrocarbon propellant at Khadji & Zahka
- (d) Phase-out of CFC-12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Mahmoud Hamida

1. In 1997, the total consumption of CFCs in the aerosol sector in Syria amounted to 914 tonnes. The Executive Committee has approved eight investment projects for the phase out of 768 tonnes of CFCs in this sector. The Government of Syria has submitted to the consideration by the Executive Committee at its 32nd Meeting four additional projects in the aerosol sector, with a total consumption of 73.1 tonnes of CFCs. Implementation of these projects will lead to the complete phaseout of CFCs in this sector.

2. The projects under consideration are for the replacement of CFCs with hydrocarbon propellant used in manufacturing different types and sizes of aerosol products:

Khadji and Zahka	144,133 cans/year	Hair spray
Badran & Co.	65,000 cans/year	Hair lacquer
Mahmoud Hamida	50,830 cans/year	Hair lacquer
Cheikh Ghazal	294,000 cans/year	Insecticides

3. The aerosol filling process under operation at each enterprise utilises one aerosol filling line (two units for Cheikh Ghazal), comprising one product filler, and a crimper and gassing unit. The enterprise will convert to HAPs technology. Conversion entails installation of indexing propellant filler to be located in open air filling rooms including a propellant handling system, a manual water bath for testing filled cans, HAP storage and purification system, gas detectors and a fire control system. A conveyor system, explosion-proof lighting and ventilation systems are also requested. The gassing unit for Khadji and Zahka aerosol plant will be located in an enclosed gassing room.

4. Technical assistance will be provided for performance and supervision of engineering designs, equipment installation and commissioning of the plant. Training in production, quality control and safety procedures will also be provided.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat and UNIDO discussed cost issues regarding conveyer systems (US \$1,800/m), a processing pump (US \$6,500) for Mahmoud Hamida project; gas detector (hand held) equipment for Cheikh Ghazal project; and an indexing propellant filler for the Khadji and Zahka project. The Secretariat also sought clarification from UNIDO on the request for the construction of an enclosed gassing room (US 30,000) and a gas detection and monitoring system (US \$25,000) for the Khadji and Zahka project proposal. The projects for the other three enterprises include an open-air filling room (US \$8,000) and a gas detector (hand held) (US \$1,000). Taking into consideration that the four projects will be implemented concurrently, some of the items associated with technology transfer and technical advisory services (i.e., travel and per diem of consultant, freight of equipment) could be shared among them. Subsequently, UNIDO agreed to adjust the capital costs as follows:

Khadji and Zahka	US \$154,055
Badran & Co.	US \$92,200
Mahmoud Hamida	US \$92,400
Cheikh Ghazal	US \$121,550

2. Calculation of the total operating savings in the four projects has been based on three components: (i) the difference in costs associated with the formulations based on CFCs or HAPs, (ii) increase in maintenance costs (at 5% of capital investment) due to the use of HAP, and (iii) increase in energy consumption due to the hot water bath and additional ventilation. The Secretariat pointed out that the incremental costs associated with maintenance are very difficult to quantify and not all of them are incremental (for example, old pieces of equipment to be replaced with new equipment; capital costs associated with racks, OAFR, and lighting). Furthermore, the increase in energy consumption due to the use of water baths is not incremental, since water baths should be in the baseline of any aerosol plant, irrespective of the propellant used. Therefore, UNIDO agreed to adjust total operating savings as follows:

Khadji and Zahka	US \$6,169
Badran & Co.	US \$10,372
Mahmoud Hamida	US \$7,524
Cheikh Ghazal	US \$34,252

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the projects with associated support cost at the funding levels indicated below:

	Project Title	Project Funding (US\$)	Support Cost (US\$)	Implementing Agency
(a)	Phase-out of CFC-11 and 12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Badran & Co.	68,640	8,923	UNIDO
(b)	Phase-out of CFC-12 in the manufacture of insecticides by conversion to hydrocarbon propellant at Cheikh Ghazal Insecticide Plant	87,298	11,349	UNIDO
(c)	Phase-out of CFC-11 and 12 in the manufacture of hair sprays by conversion to hydrocarbon propellant at Khadji & Zahka	48,400	6,292	UNIDO
(d)	Phase-out of CFC-12 in the manufacture of hair lacquers by conversion to hydrocarbon propellant at Mahmoud Hamida	46,200	6,006	UNIDO

**PROJECT EVALUATION SHEET
SYRIA**

SECTOR: Foam ODS use in sector (1999): 254.7 ODP tonnes
Sub-sector cost-effectiveness thresholds: Rigid US \$7.83/kg

Project Titles:

(a) Conversion from CFC-11 to HCFC-141b in the production of rigid foam panels at Bassam Baghdad

Project Data	Rigid	
	Bassam Baghdad	
Enterprise consumption (ODP tonnes)		18.50
Project impact (ODP tonnes)		16.40
Project duration (months)		24
Initial amount requested (US \$)		111,462
Final project cost (US \$):		
Incremental capital cost (a)		105,000
Contingency cost (b)		9,000
Incremental operating cost (c)		12,862
Total project cost (a+b+c)		126,862
Local ownership (%)		100%
Export component (%)		0%
Amount requested (US \$)		126,862
Cost effectiveness (US \$/kg.)		7.73
Counterpart funding confirmed?		
National coordinating agency	Ministry of Environment	
Implementing agency	UNIDO	

<i>Secretariat's Recommendations</i>	
Amount recommended (US \$)	126,862
Project impact (ODP tonnes)	16.40
Cost effectiveness (US \$/kg)	7.73
Implementing agency support cost (US \$)	16,492
Total cost to Multilateral Fund (US \$)	143,354

PROJECT DESCRIPTION

Sector Background

- Latest available total ODS consumption (1999)	1,808.79 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs)	2,224.60 ODP tonnes
- Consumption of Annex A Group I substances for the year 1999	1,281.20 ODP tonnes
- Baseline consumption of CFCs in foam sector	2,337.00 ODP tonnes
- Consumption of CFCs in foam sector in 1999	254.70 ODP tonnes
- Funds approved for investment projects in foam sector as of end of 1999	US \$2,138,133.00
- Quantity of CFC to be phased out in investment projects in foam sector as of end of 1999	429.40 ODP tonnes
- Quantity of CFC phased out in investment projects in foam sector as of end of 1999	1,154.10 ODP tonnes
- Funds approved for investment projects in the foam sector in 2000	US \$446,104
- Quantity of CFC to be phased out in investment projects in foam sector approved in 2000	61.10 ODP tonnes

(a) Conversion from CFC-11 to HCFC-141b in the production of rigid foam panels at Bassam Baghdad

1. Bassam Baghdad established in 1985, produces rigid polyurethane foam panels for construction of cold storage rooms. It consumed 18.5 ODP tonnes of CFC-11 in 1999.
2. The company currently operates two Cannon low-pressure dispensers (60 kg/min and an 80 kg/min) commissioned in 1987 and 1988 respectively.
3. The production will be converted to the use of HCFC-141b. The cost of conversion includes the cost of replacement of the 60 kg/min and 80 kg/min low pressure machines with high pressure machines of equivalent capacity at US \$80,000 and US \$90,000 respectively, with company contribution of US \$24,000 and US \$18,000 respectively to account for the age of the machines, and commissioning and start up at US \$10,000. Incremental operating cost amounting to US \$12,862 for two years is requested.

Justification for the use of HCFC-141b

4. UNIDO provided justification for the use of HCFC-141b in the technology evaluation. It stated that during the preparation of the project the company was briefed on the available technological options and the related technical, commercial and other issues. UNIDO provided an annex giving details of the justification, projected "techno-economic" impact of zero ODP technologies and the cost of future conversion to non-ODS technology, which are attached as

annexes to this evaluation. The Government of Syria submitted a letter supporting the project as prepared. A copy of the letter is also attached.

Impact of the project

5. When implemented 16.4 ODP tonnes of CFC-11 will be phased out. This will eliminate 6.4% of Syria's 1999 consumption of Annex A Group I substances. There will be residual ODS consumption of 2.1 ODP tonnes as a result of the conversion to HCFC-141b.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat and UNIDO discussed the project and agreed on the project's eligible grant as US \$126,862.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the Bassam Baghdad project with the funding level and associated support cost indicated below.

	Project Title	Project Funding (US\$)	Support Cost (US\$)	Implementing Agency
(a)	Conversion from CFC-11 to HCFC-141b in the production of rigid foam panels at Bassam Baghdad	126,862	16,492	UNIDO

Annex

Justification for Using HCFC Technology at Bassam Baghdad in Syria

The UNIDO technical expert appraised the enterprises in this project prior the preparation of this project document in June/July 2000, and had discussions with the company's representatives about the choice of technology for replacing CFC-based technology. The enterprise was briefed in detail about the following:

An overview of available interim (low ODP) and permanent (zero ODP) replacement technologies. The "techno-economic impact" of each technology on the products manufactured, and the process and practices employed.

Possible implications of each technology, in terms of its known impact on environment, health and safety, such as ozone depleting potential, global warming potential, occupational health, etc. It was emphasized to the company that HCFC technologies are interim technologies due to their residual ODP and therefore may continue to adversely affect the environment, although at a lower rate than CFC's.

It was further explained that HCFCs may become controlled substances under present or future international conventions and will therefore also need to be phased out at a future date, and any investment required for their phased-out and for conversion to a permanent technology will have to be borne by the enterprise itself.

The main conclusions reached by the enterprise through discussions with the UNIDO technical expert were:

The use of HCFC-141b is the only currently feasible option for the rigid P.U. foam production. Water blown technology at this point results in a product that could not be sold commercially, its density increases by 20-30% with a reduction in insulation value of 35-40%.

The companies are not prepared, as per today, to operate with inflammable and explosive materials. Their industrial safety, alarm monitoring and training system has been established in accordance with the relevant requirements of the existing production programme.

Many types of mechanical works, including welding are carried out in the production building, restricting application of flammable blowing chemicals.

Hydrocarbons are too expensive to be implemented for the small scale productions of foams.

In view of the above, among the solutions mentioned, HCFC-141b based systems is the interim technology selected until new developments (water or HCF-based systems) or new relocation of the factories allows the use of zero ODP technologies.

Projected Techno-economic Impact of zero-ODP Technologies at Bassam Baghdad

The projected impact of applying various zero-ODP technologies with respect to the selected technology (HCFC-141b) in this project is summarized below:

The only currently available zero-ODP technology is water-based systems. Water based systems are however, more expensive than other CFC-free technologies due to reductions in insulation value (requiring larger thickness) and lower cell stability (requiring higher thickness). Water based systems can be applied where insulation performance is relatively less critical, but In case of the enterprises in this project, which manufacture foam for thermal insulation application, thermal conductivity is crucial.

Presently, suitable water-based formulations are not technically mature or economical. If such formulations become available in the future, it is expected that there would still be some drawbacks related to performance and costs. The net additional impact on project cost due to increase densities, with water based systems, is conservatively expected to be about US \$225,000 with respect to HCFC-141b technology.

HFC-134a based systems are not offered in the applicable regional area and are not a feasible zero-ODP option.

Liquid HFC based systems do not meet requirements on maturity and availability at present time.

Thus, the selection of HCFC-141b based systems, as the preferred conversion technology, are justified taking into account all the technical, commercial and cost factors.

Dear Dr. El-Arini,

Re: Endorsement for the 32nd Executive Committee Meeting

This is to acknowledge receipt of proposals for the following projects for the phase out of CFCs in the refrigeration manufactures sector under the Montreal Protocol at:

- Bassam Baghdad Co.

We fully accept the project proposals and to the best of our knowledge we find the proposals financially viable and acceptable. The Government of Syria would appreciate UNIDO submission of the above project proposal for 32nd Ex Com.

Thank you very much for your kind attention and cooperation.

Best regards.

Damascus, 2 October, 2000

M.Khalcd Klaly

Coordinator, National Ozone Unit

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**PROJECT EVALUATION SHEET
SYRIA**

SECTOR: Refrigeration ODS use in sector (1999): 740 ODP tonnes
Sub-sector cost-effectiveness thresholds: Commercial US \$15.21/kg

Project Titles:

- (a) Conversion from CFC-11 to HCFC-141b technology and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Al-Raed Refrigeration

Project Data	Commercial	
	Al-Raed	
Enterprise consumption (ODP tonnes)		14.75
Project impact (ODP tonnes)		13.93
Project duration (months)		36
Initial amount requested (US \$)		211,800
Final project cost (US \$):		
Incremental capital cost (a)		142,000
Contingency cost (b)		14,200
Incremental operating cost (c)		114,198
Total project cost (a+b+c)		270,398
Local ownership (%)		100%
Export component (%)		0%
Amount requested (US \$)		211,800
Cost effectiveness (US \$/kg.)		15.21
Counterpart funding confirmed?		Yes
National coordinating agency	Ministry of State for Environmental Affairs, NOU	
Implementing agency	UNDP	

Secretariat's Recommendations	
Amount recommended (US \$)	211,800
Project impact (ODP tonnes)	13.93
Cost effectiveness (US \$/kg)	15.21
Implementing agency support cost (US \$)	27,534
Total cost to Multilateral Fund (US \$)	239,334

PROJECT DESCRIPTION

Sector Background

- Latest available total ODS consumption (1999)	1,783.00 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs)	2,224.60 ODP tonnes
- Consumption of Annex A Group I substances for the year 1999	1,280.70 ODP tonnes
- Baseline consumption of CFCs in refrigeration sector	775.17 ODP tonnes
- Consumption of CFCs in refrigeration sector in 1999	740.00 ODP tonnes
- Funds approved for investment projects in refrigeration sector as of July 2000 (31st Meeting)	US\$10,901,406.00
- Quantity of CFC to be phased out in investment projects in refrigeration sector as of end of 1999	785.00 ODP tonnes

1. The refrigeration sector in Syria consists of four large enterprises (all have received assistance from the Multilateral Fund) with a consumption of about 174 ODP tonnes. The sector is also comprised of more than 60 medium-sized enterprises, 21 of which have received assistance from the Multilateral Fund. The total 1999 consumption in the refrigeration sector (740 ODP tonnes) is sub-divided into 307.6 ODP used for manufacturing of new refrigeration equipment and 432.3 ODP for servicing.

2. The Executive Committee has approved US \$10,901,406 for 18 projects to phase out 785 ODP tonnes of CFC for enterprises manufacturing refrigeration equipment.

3. Based on data reported by Syria to the Multilateral Fund Secretariat, the country is in compliance with both the CFC freeze and potentially with the 50% reduction in 2005.

Al-Raed

4. UNDP has submitted a project proposal for Al-Raed which is a medium-size commercial refrigeration enterprise consuming 11.25 ODP tonnes of CFC-11 and 3.50 ODP tonnes of CFC-12 in the production of commercial refrigeration equipment (visi-coolers, chest-freezers and display cabinets) in 1999. The enterprise operates two low-pressure dispensers for foaming operations in the baseline.

5. The current project will phase-out 11.25 ODP tonnes of CFC-11 and 3.50 ODP tonnes of CFC-12 by converting from CFC-11 to HCFC-141b as the foam blowing agent and from CFC-12 to HFC-134a as the refrigerant. Under the current project, the existing two low-pressure foam dispensers will be replaced by a high-pressure foam machine (US \$90,000). The enterprise will require refrigerant charging units (US \$6,000) and vacuum pumps (US \$4,000). Other costs include redesign, testing, trials (US \$10,000), training (US \$10,000) and technical assistance

(US \$20,000). Incremental operating costs are requested by the enterprise reflecting the higher cost of chemicals and an increase in foam density.

Justification for the use of HCFC-141b

6. Al-Raed has selected HCFC-141b technology to replace CFC-11 in foam blowing operations. It is an interim solution until HFC systems are commercially available. A letter advising the Government decision to use HCFC technology has been received by the Secretariat in accordance with the Executive Committee Decision 27/13 and is attached to this evaluation together with a justification from the implementing agency.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat and UNDP have agreed on the above project proposal and associated costs.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the project with the level of funding and associated support costs for UNDP as indicated below.

	Project Title	Project Funding (US\$)	Support Cost (US\$)	Implementing Agency
(a)	Conversion from CFC-11 to HCFC-141b technology and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Al-Raed Refrigeration	211,800	27,534	UNDP