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Executive Committee of
the Multilateral Fund for the
Implementation of the Montreal Protocol

Eighteenth Meeting
Vienna, 22-24 November 1995

PROJECT PROPOSALS: CHINA

This document includes the Comments and Recommendationf from the Fund Secretariat on the following projects:

Foam

- Elimination of CFC-11 in the manufacture of flexible slabstock PUF at Daqui UNDP
- Elimination of CFCs in the manufacture of integral skin and cold cured PUF moldings at Jiangxi UNDP
- Elimination of CFC-11 in the manufacture of flexible slabstock PUF at Jintan UNDP
- Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Hangzhou World Bank
- Conversion to FC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Yinguang World Bank
- Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Qinhuangdao #3 World Bank
- Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Zibo No. 3 World Bank
- Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Qingyang World Bank
- Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Chengdu #7 World Bank
- Phaseout of CFCs in the manufacture of flexible slabstock PUF at Jinan Shiyan Plastic Plant World Bank

Halon

- Conversion from halon 1211 in portable fire extinguishers at the Dalian UNIDO

- | | | |
|---|---|------------|
| • | Jinzhou Fire Equipment Factory to Dry Chemical and Carbon Dioxide | |
| • | Conversion from halon 1211 in portable fire extinguishers at the Xiangshan No. 1 Fire Equipment Factory to Dry Chemical and Foam | UNIDO |
| • | Conversion from halon 1211 in portable fire extinguishers at the Jiangxi First Fire Fighting Equipment Factory to Dry Chemical and Carbon Dioxide | UNIDO |
| • | Conversion from halon 1211 in portable fire extinguishers at the Xiangshan Fire Equipment Factory to Dry Chemical and Foam | UNIDO |
| • | Halon 1211 Fire Extinguisher Production Conversion at Zhuzhou Fire Fighting Equipment Factory | World Bank |
| • | Conversion of halon fire extinguisher production at Hangzhou | World Bank |
| • | Conversion of the halon 1211 fire extinguisher of fire fighting equipment plant of Benxi iron and Steel Corp. | World Bank |

Refrigeration

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|---|---|-------|
| • | Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Henan Freezer Factory | UNDP |
| • | Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Guingdao Haier General Freezer Co. | UNDP |
| • | Phasing out ODS at the Hangzhou Huari Refrigerator Co. | UNIDO |
| • | Phasing out ODS at the Compressor Factory of the Huangshi Dongbei Refrigeration Co. | UNIDO |

Solvents

- | | | |
|---|--|------|
| • | Elimination of the use of CFC-113 and methyl chloroform in the color picture tube cleaning processes at the Shanghai Novel CPT Corp. Factory | UNDP |
| • | Elimination of CFC-113 used in the production line at Hunan Computer Factory | UNDP |
| • | Elimination of the use of TCA in the Baoshi Electronics Corporation Shijazhuang Manufacturing Operations | UNDP |
| • | Elimination of the use of CFC-113 in the electron gun final cleaning processes at the Tianjin Picture Tube Factory | UNDP |
| • | Elimination of CFC-113 used in the production line at Shanghai Sixth Radio Factory | UNDP |

PROJECT EVALUATION SHEET **CHINA**

SECTOR: FOAM ODS use in sector (1991): 13,153 ODP tonnes
 Sub-sector cost-effectiveness thresholds: Flexible (slabstock) foam US \$6.23/kg
 Integral skin foam US \$16.86/kg

Project Titles:

- (a) Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam in nine foam plants (See below) *
 (b) Elimination of CFC in the manufacture of integral skin and cold cured polyurethane foam moldings at Jiangxi Auto Eng. Plastic Plant.*

Project Data	Flexible Slabstock Foam									Integral Skin Foam
	Chengdu Plastics No. 7	Hangzhou Plastic Foam Fac.	Jinan Shiyuan Plastic plant	Qingyang Chem. Corp.	Qinghuan gdao No. 3 Plastic Plant	Yinguang Chemical Group	Zibo No. 3 Plastic Plant	Tianjin Daqui Foam Plant	Jiangsu Jintan Insulation Mat.	Jiangxi Auto Eng. Plastic Plant
ODS (CFC-11) phase out (ODP tonnes)	120	60	35	90	60	85	100	190	12	40
Proposed project duration (Yrs)	1.5	1.5	1	1.5	1.5	1.5	1.5	1	1	1
Incremental capital cost (US\$)	385,000	297,000	203,500	341,000	385,000	341,000	297,000	215,000	77,000	110,000
Contingency (%)	10	10	10	10	10	10	10	10	10	10
Incremental operational cost (US\$)	(84,000)	20,000	5,800	21,000	50,000	35,000	(48,000)	(55,000)	(11,000)	60,000
Total project cost (US\$)	301,000	317,000	209,300	362,000	435,000	376,000	249,000	160,000	66,000	170,000
Local ownership (%)	100	100	100	100	100	100	100	100	100	100
Export component (%)	0	0	0	0	0	0	0	0	0	0
Amount requested (US\$) {Original	480,400	385,000	215,600	515,000	384,200	507,000	392,400	159,000	70,000	180,000
{Revised	301,000	317,000	209,300	362,000	370,000	376,000	249,000	160,000	66,000	170,000
Cost effectiveness (US\$/kg.)	2.50	5.28	5.98	4.02	6.17	4.42	2.49	0.84	5.50	4.25
National Coordinating Agency	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA
Implementing Agency	WB	WB	WB	WB	WB	WB	WB	UNDP	UNDP	UNDP
Technical review completed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Secretariat's Recommendations										
Amount recommended (US \$)	301,000	317,000	209,300	362,000	370,000	376,000	249,000	160,000	66,000	170,000
Project Impact (ODP tonnes)	120	60	35	90	60	85	100	190	12	39.2
Cost effectiveness (US \$/kg)	2.50	5.28	5.98	4.02	6.17	4.42	2.49	0.84	5.50	4.33
Implementing Agency support cost (US\$)	39,130	41,210	27,210	47,060	48,100	48,880	32,370	20,800	8,580	22,100
Total cost to Multilateral Fund	340,130	358,210	236,510	409,060	418,100	424,880	281,370	180,800	74,580	192,100

* New proposals to 18th Meeting

PROJECT DESCRIPTION

- (a) Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam in nine foam plants (See below)

1. Phase-out of CFC-11 in the manufacture of flexible (slabstock) foam at the following plants: Chengdu Plastic No. 7, Hangzhou Plastic Foam, Jinan Shiyan Plastic, Qingyang Chemical Corporation, Qinghuangdao No. 3 Plastic, Tianjin Daiqui Foam, Yinguang Chemical Corporation and Zibo No. 3 Plastic, will be accomplished by using the combination of forced cooling and methylene chloride technologies. The project requires forced cooling system, storage and metering system for methylene chloride, improved ventilation and safety systems, technical support for converting the formulations and process and safety training. Capital costs of the projects therefore relate to the cost of these items.

2. The phase out of CFC-11 at Jiangsu Jintan Insulation Material Plant, will also be accomplished by converting from CFC-11 to methylene chloride as an auxiliary blowing agent. The project, however, requires only storage and metering systems for methylene chloride and additives, improved ventilation and safety systems, technology transfer from an external process expert for using the new formulations and process and safety training.

- (b) Elimination of CFC in the manufacture of integral skin and cold cured polyurethane foam moldings at Jiangxi Auto Eng. Plastic Plant.

3. The phase-out of CFC-11 consumption in the production of PUF moldings, at Jiangxi Automobile Engineering Plastics Factory, will be accomplished by converting to HCFC-141b for the integral skin operation and all water blown system for the cold cured molded products. The project will require the provision of a pre-mix station, since the enterprise already has a high pressure foam dispenser, trials, technology transfer and training. Incremental operating costs, are due to the higher cost of the HCFC-141b based formulation and to the increased consumption of MDI.

4. The justification of the use of HCFC-141b in the above project was that it is considered (in the country) as the most acceptable interim substitute blowing agent for its ability:

- to perform auxiliary function, such as skin formation and decrease of viscosity
- to satisfy the market requirement for esthetics

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The main capital cost item in all the projects is the cost of the forced cooling system which is about 60-70 per cent of the capital cost in the projects. The costs of the forced cooling systems were estimated on the basis of the type and operational characteristics of the machines at about US \$3,500/m of cooling tunnel. Maxfoam machines and Hennecke machines cost 2½ and 3½ times as much to be fitted with forced cooling system as vertifoam machines. hence, the differences in capital costs.

2. One reviewer questioned the use of combination of methylene chloride and forced cooling system and recommended the use of “urethane grade” methylene chloride to avoid scorching. A response in the project document, however, indicated that the methylene chloride available in China is not foam grade and contains contaminants. Furthermore, the locally manufactured polyurethane systems also contain contaminants. The use of these chemicals are likely to cause scorching and adversely affect the foam quality without forced cooling.

RECOMMENDATIONS

1. The Fund Secretariat recommends approval of the projects with associated support costs at the funding levels shown in the table below:

Project	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Flexible (Slabstock) Foam			
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Chengdu No. 7 Plastic Plant	301,100	39,130	World Bank
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Hangzhou Plastic Foam Factory	317,000	41,210	World Bank
Phaseout of CFCs in the manufacture of flexible (slabstock) polyurethane foam at Jinan Shiyan Plastic Plant	209,300	27,210	World Bank
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Qingyang Chemical Corporation	362,000	17,060	World Bank
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Qinghuangdao No. 3 Plastic Plant	370,000	48,100	World Bank
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Yinguang Chemical Corporation	376,000	48,880	World Bank
Conversion to CFC-free technology in the manufacture of flexible (slabstock) polyurethane foam at Zibo No. 3 Plastic Plant	249,000	32,370	World Bank

Project	Project Cost US \$	Support Cost US \$	Implementing Agency
Elimination of CFC-11 in the manufacture of flexible (slabstock) PUF at Jiangsu Jintan Insulation Material	66,000	8,580	UNDP
Elimination of CFC-11 in the manufacture of flexible (slabstock) PUF at Tianjin Daiqui Foam Plant	160,000	20,800	UNDP
(b) Integral Skin			
Elimination of CFCs in the manufacture of integral skin and cold cured polyurethane foam moldings at Jiangxi Auto. Eng. Plastic Plant	170,000	22,100	UNDP

2. The implementing agencies and the Government of China should explore the possibilities of improving access of the flexible foam manufacturers who select the methylene chloride technology to foam grade methylene chloride and polyurethane systems, in order to reduce the costs of methylene chloride projects in the country.

PROJECT EVALUATION SHEET **CHINA**

SECTOR: HALON

ODS use in sector (1994):

21,700 ODP tonnes

Sub-sector cost-effectiveness thresholds:

US \$1.48/kg

Project Titles:

- (a) Conversion from Halon 1211 in Portable Fire Extinguishers at the Dalian Jinzhou Fire Equipment Factory to Dry Chemical and Carbon Dioxide*
- (b) Conversion from Halon 1211 in Portable Fire Extinguishers at the Jiangxi First Fire Fighting Equipment Factory to Dry Chemical and Carbon Dioxide*
- (c) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan No. 1 Fire Equipment Factory to Dry Chemical and Foam*
- (d) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan Fire Equipment Factory to Dry Chemical and Foam*
- (e) Halon 1211 Fire Extinguisher Production Conversion at Zhuzhou Fire Fighting Equipment Factory
- (f) Conversion of the Halon 1211 Fire Extinguisher of Fire Fighting Equipment Plant of Benxi Iron and Steel Corp.*
- (g) Conversion of Halon Fire Extinguisher Production at Hangzhou Fire Equipment Factory*

Project Data	Dalian Jinzhou	Jiangxi	Xiangshan No. 1	Xianshan Fire Eq.	Zhuzhou	Benxi	Hangzhou
ODS (CFC-11) phase out (ODP tonnes)	300	600	900	900	732	150	310
Proposed project duration (Yrs)	2	2	2	2	1	1	1
Incremental capital cost (US\$)	348,118	601,294	761,824	766,529	406,200	168,500	578,600
Contingency (%)	0	0	0	0	15	15	10
Incremental operational cost (US\$) ¹	-10,838	91,829	-66,618	-69,706	-112,600	-24,000	-5,800
Total project cost (US\$)	337,279	693,124	695,206	696,824	293,600	144,500	572,800
Local ownership (%)	100	100	100	100	100	100	100
Export component (%)	0	0	0	0	0	0	0
Amount requested (US\$) ☐ Original	337,279	693,124	695,206	696,824	293,600	144,500	572,800
☐ Revised	337,279	693,124	695,206	696,824	293,600	144,500	572,800
Cost effectiveness (US\$/kg.)	1.13	1.15	0.77	0.77	0.40	0.96	0.62
National Coordinating Agency	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA	NEPA
Implementing Agency	UNIDO	UNIDO	UNIDO	UNIDO	World Bank	World Bank	World Bank
Technical review completed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Secretariat's Recommendations							
Amount recommended (US \$)	117,057	180,994	82,514	32,935	153,579	75,935	129,457
Project Impact (ODP tonnes)	300	600	900	900	732	150	930
Cost effectiveness (US \$/kg)	0.39	0.30	0.09	0.04	0.21	0.51	0.14
Implementing Agency support cost (US\$)	15,217	23,529	10,727	4,282	19,965	9,872	16,829
Total cost to Multilateral Fund	132,274	204,523	93,241	37,217	173,544	85,807	146,286

* New proposals to 18th Meeting.

¹ Based on 6 months.

PROJECT DESCRIPTION

1. These projects represent the conversion from halon 1211 fire extinguisher manufacturing to multiple technologies including ABC powder, carbon dioxide (CO₂), and affinity light water film forming foam (AFFF) fire extinguisher manufacturing. The expected conversion product mix varies to include an ABC powder component of from 66 per cent to 85 per cent. In most cases, the converted product mix includes a conversion to two technologies while in one case, Huangzhou, halon 1211 is converted to all three technologies. All conversions were developed to deliver the same level of fire protection for consumers of the present production of halon 1211 fire extinguishers.

2. The proposals indicate that the Chinese strategy for phasing out the halon sector will consist of the following clusters of projects:

1996/97	21 fire extinguisher manufacturers	12 halon producing units
1998/99	20 fire extinguisher manufacturers	5 halon producing units
2000/01	27 fire extinguisher manufacturers	4 halon producing units
2001/02	13 fire extinguisher manufacturers	3 halon producing units

(a) Conversion from Halon 1211 in Portable Fire Extinguishers at the Dalian Jinzhou Fire Equipment Factory to Dry Chemical and Carbon Dioxide

3. This project phases out the annual use of 100 MT of Halon 1211 (300 MT ODP-weighted ODS, ODP = 3.0) in portable fire extinguishers produced by the Dalian Jinzhou Fire Equipment Factory. The phase-out will be accomplished by a total change of the production facilities to replace one third of the Halon 1211 with carbon dioxide and two-thirds with ABC dry chemical extinguishing agent.

(b) Conversion from Halon 1211 in Portable Fire Extinguishers at the Jiangxi First Fire Fighting Equipment Factory to Dry Chemical and Carbon Dioxide

4. This project phases out the annual use of 200 MT of Halon 1211 (600 MT ODP-weighted ODS, ODP = 3.0) in portable fire extinguishers produced by the Jiangxi First Fire Fighting Equipment Factory. The phase-out will be accomplished by a total change of the production facilities to replace one-third of the Halon 1211 with carbon dioxide and two-thirds with ABC dry chemical extinguishing agent.

(c) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan No. 1 Fire Equipment Factory to Dry Chemical and Foam

5. This project phases out the annual use of 300 MT of Halon 1211 (900 MT ODP-weighted ODS, ODP = 3.0) in portable fire extinguishers produced by the Xiangshan No. 1 Fire Equipment Factory. The phase-out will be accomplished by a change of the production facilities to replace one-third of the Halon 1211 with AFFF foam and two-thirds with ABC dry chemical extinguishing agent.

- (d) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan Fire Equipment Factory to Dry Chemical and Foam

6. This project phases out the annual use of 300 MT of Halon 1211 (900 MT ODP-weighted ODS, ODP = 3.0) in portable fire extinguishers produced by the Xiangshan Fire Equipment Factory. The phase-out will be accomplished by a change of the production facilities to replace one-third of the Halon 1211 with AFFF foam and two-thirds with ABC dry chemical extinguishing agent.

- (e) Halon 1211 Fire Extinguisher Production Conversion at ZHUZHOU Fire Fighting Equipment Factory

7. This project eliminates 732 MT ODP per year (244 MT Halon 1211) in China, based on actual production performance for new cylinders in 1994. Halon 1211 extinguisher production will be replaced by ABC dry Chemical Powder and Light Water Foam (AFFF Foam) fire extinguisher production. The project includes redesign and incremental equipment for the factory to convert to the alternate fire fighting chemicals.

- (f) Conversion of the halon 1211 Fire Extinguisher of Fire Fighting Equipment Plant of Benxi Iron and Steel Corp.

8. This project will phase out the use of 50 tonnes halons annually by converting an existing production of 25,000 halon 1211 portable fire extinguishers to ABC powder extinguishers (85 per cent) and CO₂ fire extinguishers (15 per cent). The project involves replacing/modifying machines used in the production of cylinders, filling equipment for ABC powder extinguishers and CO₂ fire extinguishers and modification of the existing building facility.

- (g) Conversion of halon fire extinguisher production at Hangzhou Fire Equipment Factory

9. This project will eliminate 930 MT ODP per year (310 MT halon 1211) in China. Halon 1211 portable fire extinguisher production will be replaced by production of ABC DCP, AFFF and CO₂ extinguisher system. The project includes conversion of the existing production facilities and necessary modification of existing machines as well as additional equipment required. The factory, at its cost, will add sprinkler fire protection systems.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The guidelines for this sub-sector (UNEP/OzL.Pro/ExCom/16/20, paras. 81-82) were developed as a result of a paper (UNEP/OzL.Pro/ExCom/16/16) that assessed the level of funding required to implement the guidelines on the basis of a country-wide conversion. The paper assumed that 85 per cent of the enterprises would convert to ABC powder (the most cost-effective and most likely in-kind alternative in most applications) and 15 per cent, to CO₂ (the least cost-effective and likely alternative in certain special applications). These proposals apply varying ratios of converted product mixes at the enterprise level, instead of product mixes representing a one-to-one technology conversion at the enterprise level and an overall product mix for the country as a whole.

2. The guidelines require a conversion on the basis of a sub-sectoral phase-out or groups of companies that compete for the same market. China's strategy for this sector is currently under development but the proposals indicated a grouping of fire extinguisher manufacturers with an associated conversion or closure of halon production facilities. Two halon production closure projects, "Jinzhou (Dalian) Fire Equipment Factory" and "Dongguan Fire Equipment Company" were submitted with the extinguishers projects. However, the Secretariat seeks guidance from the Executive Committee on how to assess the closure projects.

3. The Report of the Expert Group on the Production of ODS Substitutes (UNEP/OzL.Pro/ExCom/18/71) is recommending the consideration of foregone profits for production facility closures but items critical to the assessment of closure projects such as the length of calculation of foregone profits and employee enforced idleness (unemployment) have not been determined. Therefore, the two closure projects were not forwarded to the Eighteenth Meeting.

4. The Secretariat reviewed all of the halon fire extinguisher conversion projects submitted to the Eighteenth Meeting together to provide a consistent approach in line with the existing guidelines and other pertinent decisions of the Executive Committee to determine the incremental costs in this sub-sector. Several technical experts were consulted to determine if the equipment requests are unique to the conversion technologies or if the requested equipment represents equipment in the baseline condition. Allocations were made for some modifications to existing equipment and the provision of new filling equipment. Allocations were also made for testing equipment, technical assistance, installation, and new product approval.

5. Capacity expansion represented by multiple technologies was adjusted to avoid double-counting by providing one equipment type per project. Building modification costs were not considered eligible for safety reasons since the alternative technologies are not of an explosive nature. Provisions were made, however, for adverse environmental effects from dust by, for example, allocations for dust collection/removal equipment.

6. The assessment of the resulting grant amounts for high-consuming enterprises was proportionately lower than for low-consuming enterprises. This occurs for projects with

significant operational savings as indicated in the paper presented to the Executive Committee on projects that might result in net incremental savings (UNEP/OzL.Pro/ExCom/13/42). As a result of that paper, the Executive Committee suggested that a sector strategy could contain a request for funding and a plan for the distribution of the country's total sectoral incremental costs to address any unintentional market distortions created by the calculation of incremental costs for projects with significant incremental operational savings. A sub-sector strategy, as recommended by the Committee's guidelines for this sub-sector, would enable countries to account for these market distortions.

7. Operational savings were assessed to ensure that the same production capacity and level of fire protection was afforded given the technology choice and the choice of the product lines in terms of sizes of extinguishers. A materials balance approach which indicates both the baseline and with-project components of operational costs/savings analyses would facilitate the assessment of operational savings.

RECOMMENDATIONS

1. The Fund Secretariat recommends approval of the projects with associated support costs at the funding level shown in the table below:

<u>Project</u>	<u>Project Cost</u> <u>US \$</u>	<u>Support Cost</u> <u>US \$</u>	<u>Implementing</u> <u>Agency</u>
(a) Conversion from Halon 1211 in Portable Fire Extinguishers at the Dalian Jinzhou Fire Equipment Factory to Dry Chemical and Carbon Dioxide	117,057	15,217	UNIDO
(b) Conversion from Halon 1211 in Portable Fire Extinguishers at the Jiangxi First Fire Fighting Equipment Factory to Dry Chemical and Carbon Dioxide	180,994	23,529	UNIDO
(c) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan No. 1 Fire Equipment Factory to Dry Chemical and Foam	82,514	10,727	UNIDO
(d) Conversion from Halon 1211 in Portable Fire Extinguishers at the Xiangshan Fire Equipment Factory to Dry Chemical and Foam	32,935	4,282	UNIDO
(e) Halon 1211 Fire Extinguisher Production Conversion at Zhuzhou Fire Fighting Equipment Factory	153,579	19,965	World Bank
(f) Conversion of the Halon 1211 Fire Extinguisher of Fire Fighting Equipment Plant of Benxi Iron and Steel Corp.	75,935	9,872	World Bank

<u>Project</u>	<u>Project Cost</u> <u>US \$</u>	<u>Support Cost</u> <u>US \$</u>	<u>Implementing</u> <u>Agency</u>
(g) Conversion of Halon Fire Extinguisher Production at Hangzhou Fire Equipment Factory	129,457	16,829	World Bank

2. To request implementing agencies to utilize a materials balance approach to the calculation of incremental operating costs/savings in the halon fire extinguisher sub-sector and to specify the after conversion product line in terms of the sizes of fire extinguishers to be produced through the conversion.

3. To request Article 5 countries with several halon fire extinguisher manufacturers to included in their sub-sector phase-out requests for funding and a plan for the distribution of the country's total sectoral incremental costs to address any unintentional market distortions.

4. The Fund Secretariat further recommends that project (e) be included in the Consolidated List.

PROJECT EVALUATION SHEET CHINA

SECTOR: REFRIGERATION ODS use in sector (1992): 5,650 ODP tonnes
 Sub-sector cost-effectiveness thresholds: Domestic refrigeration US \$13.76/kg

Project Titles:

- (a) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Henan Freezer Factory*
- (b) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Guindao Haier General Freezer Company*
- (c) Phasing out ODS at the Hangzhou Huari Refrigerator Co. *
- (d) Phasing out ODS at the Compressor Factory of the Huangshi Dongbei Refrigeration Co.*

Project Data	Domestic Refrigeration			Compressor
	Henan	Haier	Huari	Huangshi Dongbei
ODS phase-out (ODP tonnes)	167.69	278.80	338	n.a. **
Proposed project duration (Yrs)	1.5	1.5	2	2
Incremental capital cost (US\$)	1,865,800	1,508,750	2,479,532	899,030
Contingency (%)	10	10	10	10
Incremental operational cost (US\$)	684,805	1,039,529	348,379	0
Total project cost (US\$)	2,550,605	2,548,279	2,827,911	899,030
Local ownership (%)	100	100	100	100
Export component (%)	0	0	0	0
Amount requested (US\$) {Original	2,860,555	2,844,529	4,884,792	1,546,600
{Revised	2,550,605	2,548,279	2,827,911	899,030
Cost effectiveness (US\$/kg)	9.88	5.94	5.43	n.a.
National Coordinating Agency				NEPA
Implementing Agency	UNDP	UNDP	UNIDO	UNIDO
Technical review completed?	Yes	Yes	Yes	Yes

<i>Secretariat's Recommendations</i>				
Amount recommended (US \$)	2,550,605	2,548,279	2,827,911	899,030
Project impact (ODP tonnes)	167,69	278,80	338	n.a.
Cost effectiveness (US \$/kg)	9.88	5.94	5.43	n.a.
Implementing Agency support cost (US\$)	371,872	331,276	367,628	116,874
Total cost to Multilateral Fund	2,922,477	2,879,555	3,195,539	1,015,904

* New proposals to 18th Meeting

** Conversion of compressor manufacturing facility to non-ODS technology does not phase-out ODSs directly.

PROJECT DESCRIPTION

Domestic Refrigeration

- (a) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Henan Freezer Factory
- (b) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Guindao Haier General Freezer Company
- (c) Phasing out ODS at the Hangzhou Huari Refrigerator Co.

1. There are an estimated 100 domestic refrigerator and freezer production lines with a production capacity of 15 million units per annum in China. About 60 per cent of the total number of domestic refrigeration appliances are produced by ten refrigerator manufacturers with annual output of more than 300,000 units each. The Executive Committee approved nine projects for the largest domestic refrigerator manufacturers in China.

2. The current annual production at the three companies under consideration is as follows: Henan - 192,280 units; Haier - 218,133 units; Huari - 308,300,000 units. All the current production is sold in China. Under the projects submitted, the three companies will eliminate a total consumption of 784.5 MT of CFC-11 by converting to HFC-134a and isobutane as refrigerants, and to cyclopentane as the blowing agent. The proposals are included in the strategy of the Government of China for the phase-out of CFCs in the domestic refrigeration sector.

3. Conversion to HFC-134a and isobutane refrigerants involves the replacement of refrigerant charging boards, leak detectors, refitting existing vacuum system, model redesign and testing.

4. Conversion to cyclopentane entails the replacement of existing low pressure foam machines with high pressure machines, retrofitting of existing high pressure machines, modifying fixtures, providing cyclopentane storage and delivery systems, and replacement of premixing stations. Conversion to cyclopentane and isobutane will necessitate also implementing a stringent safety programme to ensure personnel and plant safety owing to the flammable nature of cyclopentane and isobutane.

5. Refrigerator model redesign and the technical aspects of the conversion including safety measures associated with cyclopentane application, will be supervised by specialized consultants appointed and fielded by UNDP and UNIDO. General Contractors will also be appointed by UNDP and UNIDO respectively for the implementation of the major project components (foaming system, refrigeration system, fire protection system, exhausting and ventilation system, on-the-job training, etc.). These arrangements would ensure a proper technology transfer and safe operations.

6. Incremental operational costs are associated with new HFC-134a compressor, refrigeration system optimization, higher cost of the refrigerant and extra polyurethane foam due to increased density. Incremental operational costs are calculated for six months of operation.

(d) Phasing out ODS at the Compressor Factory of the Huangshi Dongbei Refrigeration Co.

7. There are 18 local compressor producers in China which satisfy the demand of the domestic refrigeration sector. Total annual output is about 6 million units. Three projects have been approved by the Executive Committee to convert three compressor manufacturing companies to non-ODS technology.

8. The current annual production at Dongbei factory is 350,000 units. The project covers the conversion of production of CFC-12 based compressors to isobutane refrigerant. This is the second project to produce isobutane compressors in China. The proposal includes: redesign, prototyping and testing, modification of existing equipment where applicable, procurement and installation of new equipment, modification of assembly lines and safety measures. The proposal is included in the strategy of the Government of China for the phase out of CFCs in the domestic refrigeration sector.

9. A General Contractor will be appointed by UNIDO for the implementation of major project components. The General Contractor will be responsible for the supply of equipment, installation, commissioning and on-the-job training of Dongbei's staff. In order to guarantee smooth technology transfer and ensure that appropriate safety standards are adhered to, the General Contractor will issue an Operational Safety Statement.

10. Dongbei will provide its own inputs and cost-sharing during the implementation of the project.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The chosen technologies are proven.
2. The enterprises will share cost of several equipment items.
3. The Secretariat discussed with implementing agencies the eligibility and incrementality of all cost items. The projects budgets have been adjusted accordingly. All the recommended amounts are below the cost-effectiveness thresholds of the sub-sector.

RECOMMENDATIONS

1. The Fund Secretariat recommends approval of the projects with associated support costs at the funding level shown in the table below:

Project	Project Cost US \$	Support Cost US \$	Implementing Agency
<u>Domestic Refrigeration</u>			
(a) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Henan Freezer Factory	2,860,555	371,872	UNDP
(b) Elimination of CFC-11 and 12 in the manufacture of Domestic Freezers at Guindao Haier General Freezer Company	2,548,279	331,276	UNDP
(c) Phasing out ODS at the Hangzhou Huari Refrigerator Co.	2,827,911	367,628	UNIDO
<u>Refrigeration Compressor</u>			
Phasing out ODS at the Compressor Factory of the Huangshi Dongbei Refrigeration Co.	899,030	116,874	UNIDO

2. It is further recommend that the funding approved should be considered as part of future allocations for the implementation of China's strategy in the domestic refrigeration sector.

PROJECT EVALUATION SHEET CHINA

SECTOR: **SOLVENT** ODS use in sector (1991) 3,036 ODP tonnes

Sub-sector cost-effectiveness thresholds: CFC-113 US \$19.73/kg
1,1,1 TCA (methyl chloroform) US \$38.5/kg
Mixed N/A

Project Titles:

- (a) Elimination of CFC-113 used in the production line at Hunan Computer Factory*
- (b) Elimination of the use of CFC-113 in the electron gun final cleaning processes at the Tianjin Picture Tube Factory*
- (c) Elimination of CFC-113 used in the production line at Shanghai Sixth Radio Factory*
- (d) Elimination of the use of TCA in the Baoshi Electronic Corporation, Shijazhuan Manufacturing Operations*
- (e) Elimination of the use of CFC-113 and methyl chloroform in the color picture tube cleaning processes at the Shanghai Novel CPT Corp. Factory*

Project Data	CFC-113			1,1,1 TCA	Mixed
	Hunan	Tianjin	Shanghai Sixth Radio	Baoshi	Shanghai Novel CPT
ODS phase-out (ODP tonnes)	21.0	6.7	16.4	7.4	75.0
Proposed Project Duration (Yrs)	2	2	2	2	2
Incremental capital cost (US \$)	126,000	233,000	165,000	454,000	1,329,000
Contingency (%)	6	6	10	6	10
Incremental operational cost (US \$)	(22,000)	(6,800)	(26,000)	25,000	196,000
Total project cost (US \$)	104,700	226,200	138,400	479,000	1,132,600
Local Ownership (%)	100	100	100	100	75
Export component (%)	5	-	-	20	5
Amount requested (US \$) {Original	136,000	132,600	211,300	284,900	865,950
{Revised	104,700	132,600	138,400	284,900	849,450
Cost Effectiveness (US \$/kg)	4.99	19.73	10.4	38.5	11.33
National Coordinating Agency		NEPA/MEI	NEPA/MEI	NEPA/MEI	NEPA/MEI
Implementing Agency	UNDP	UNDP	UNDP	UNDP	UNDP
Technical Review Completed?	Yes	Yes	Yes	Yes	Yes

Secretariat's Recommendations					
Amount recommended (US \$)	104,700	132,600	138,400	284,900	849,950
Project Impact (ODP tonnes)	21.0	6.7	4.53	7.4	75.0
Cost effectiveness (US \$/kg)	4.99	19.73	10.4	38.5	11.33
Impl. Agency Support Cost (US \$)	1,3611	17,238	17,992	39,037	110,493
Total Cost to Multilateral Fund	118,311	149,838	156,392	321,937	960,443

* New proposal to the 18th Meeting.

PROJECT DESCRIPTION

(a) HUNAN

1. This project will phase out 21.03 ODP tonnes of CFC-113 used in vapour degreasers to clean computer parts and circuit boards at Hunan Computer factory in the city of Changsha. Replacement of ODS used in the production line will be accomplished by replacing the currently used cleaning methods with an aqueous based process.

(b) TIANJIN

2. The Tianjin Picture Tube Factory uses 6.7 ODP tonnes of CFC-113 in the final cleaning steps of electron gun manufacture. Cleanliness and compatibility with the delicate sections of the electron gun are critical for the desired performance of the finished picture tube, thus this application is different from the degreasing of metal parts after stamping or forming operations seen in some other projects in the solvent sector. The project will identify, qualify and install a non-ODS chlorinated solvent cleaning process. The type of chlorinated solvent will be decided after trials when the equipment has been installed. The equipment design includes vapour containment and venting arrangements necessary for the safe use of chlorinated solvents.

(c) SHANGHAI SIXTH RADIO

3. This project will phase out 16.04 ODP tonnes of CFC-113 used in vapour degreasers to clean computer parts and circuit boards at Shanghai Sixth Radio Factory in the city of Shanghai. Replacement of ODS used in the production line will be accomplished by replacing the currently used cleaning methods with a hydrocarbon solvent based process.

(d) BAOSHI

4. The Baoshi Components Factory, located in Shijiazhuang province uses 7.4 ODP tonnes of TCA in the manufacturing process for the production of cathode ray tubes (TV tubes). The TCA is used for high quality cleaning of small metal parts prior to further processing. Cleanliness of the parts is critical to the performance of the finished picture tube. This project will identify, qualify and install non-ODS cleaning processes in these manufacturing operations, thereby phasing out the use of TCA at the Baoshi Components Factory. Chlorinated hydrocarbon solvents are proposed for the cleaning of small metal parts and an aqueous or semi-aqueous process for cleaning the electron gun assembly.

(e) SHANGHAI NOVEL CPT

5. The Shanghai Novel Factory uses 58.6 ODP tonnes of CFC-113 and 16.4 ODP tonnes of TCA in the manufacture of “shadow masks” a critical component of TV picture tubes. Cleanliness and compatibility with the delicate sections of the tube are critical to the desired performance of the finished product, therefore this application is different from the degreasing of metal parts after stamping or forming operations seen in some other projects in the solvent sector. This project will identify, qualify and install a large two-stage non-ODS aqueous

cleaning process that meets these criteria, thereby phasing out the use of CFC-113 at this factory. The cost estimates for the major items of equipment are based on the costs of similar equipment currently being installed by the enterprise as part of an expansion of its operations.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. Projects (b) Tianjin, and (d) Baoshi, were submitted initially to the 13th Meeting but no decision was taken at that time "leaving parties free to consult with one another with a view to clarifying the issues so that there would be a clear agreement on their intent."
2. The Solvent Sector Strategy for China was presented to the 17th Meeting of the Executive Committee. The five solvent project proposals now submitted are in agreement with the sectoral strategy. However, in the light of progress the Executive Committee is trying to make towards a sectoral approach, rather than an approach based on approval of individual projects, the Fund Secretariat observes that there would be merit in emphasis being placed on the formulation of umbrella projects which demonstrate the implementation of a sectoral approach. Further, future projects could be formulated to demonstrate the benefits which will be realized from both the Applications Development Centre and the Manufacturing Centre for non-ODS Cleaning Equipment, projects for which were funded at the 12th Meeting.
3. Several cost and eligibility issues were discussed with the implementing agency and agreement reached on adjustment to project costs. In particular, projects were examined to ensure there was no double counting of technology development with the Applications Development Centre and no purchase of cleaning equipment which might become available from the Manufacturing Centre.
4. Projects (b) Tianjin, and (d), Baoshi, include a financial contribution by the enterprise. The Fund Secretariat considers that incremental costs to the level of the grant sought are eligible. However, the Fund Secretariat makes no comment on the validity or otherwise of the total level of incremental costs included in the project submission.

RECOMMENDATIONS

1. The Fund Secretariat recommends approval of the projects with associated support costs at the funding level shown in the table below:

Project	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Elimination of CFC-113 used in the production line at Hunan Computer Factory	104,700	1,3611	UNDP
(b) Elimination of the use of CFC-113 in the electron gun final cleaning processes at the Tianjin Picture Tube Factory	132,600	17,238	UNDP
(c) Elimination of CFC-113 used in the production line at Shanghai Sixth Radio Factory	138,400	17,992	UNDP
(d) Elimination of the use of TCA in the Baoshi Electronic Corporation, Shijazhuan Manufacturing Operations	284,900	39,037	UNDP
(e) Elimination of the use of CFC-113 and methyl chloroform in the color picture tube cleaning processes at the Shanghai Novel CPT Corp. Factory	849,950	110,493	UNDP

2. The Fund Secretariat recommends that for the solvent sector in China, the relevant implementing agency places emphasis on the development of an overall sectoral approach involving major sub-sectoral groups. Additionally, project groups should be formulated which demonstrate the benefits gained from both the Cleaning Applications Development Centre and the Manufacturing Centre for non-ODS Cleaning Equipment. Any individual projects should explicitly address the opportunities to make use of the output from these facilities.