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Executive Committee of
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Implementation of the Montreal Protocol
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Cairo, 11-13 November 1998

PROJECT PROPOSALS: CHINA

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

Foam

- Conversion to LCD technology in the manufacture of flexible slabstock polyurethane foam at Ningbo Yongling Rubber & Plastic Co. UNDP
- Conversion to HCFC-141b in the manufacture of rigid and pour-in-place polyurethane foams at Corrosionproof & Insulation Co., Ltd. UNDP
- Conversion to HCFC-141b in the manufacture of rigid and spray polyurethane foams at Daqing Petroleum Organization Bureau UNDP
- Conversion of refrigerator manufacture from CFC-11 to pentane foam blowing agent in the production of PU insulation panels at Foshan Refrigeration Equipment General Factory World Bank
- Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Guangdong Commercial Refrigeration Equipment Co. (GCREC) UNDP
- Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Kaifeng Air Separation Group Ltd (KFAS) UNDP
- Conversion to cyclopentane in the manufacture of PU-insulated heating pipes at Tianjin Pipeline Engineering Group Co. Ltd. UNDP
- Conversion of refrigerator manufacture in Zhenjiang Radio Factory from CFC-11 to N-pentane foam blowing agent in the production of PU insulation panels UNDP

Halon

- Halon sector 1999 annual programme World Bank

Refrigeration

- Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory UNIDO
- Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China UNIDO
- MAC Sector Plan World Bank

PROJECT EVALUATION SHEET**CHINA**

SECTOR: FOAM ODS use in sector (1996): 27,540 ODP tonnes
 Sub-sector cost-effectiveness thresholds: Flexible LCD US \$6.23/kg
 Rigid US \$7.83/kg

Project Titles:

- (a) Conversion to LCD technology in the manufacture of flexible slabstock polyurethane foam at Ningbo Yongling Rubber & Plastic Co.
- (b) Conversion to HCFC-141b in the manufacture of rigid and pour-in-place polyurethane foams at Corrosionproof & Insulation Co., Ltd.
- (c) Conversion to HCFC-141b in the manufacture of rigid and spray polyurethane foams at Daqing Petroleum Organization Bureau
- (d) Conversion of refrigerator manufacture from CFC-11 to pentane foam blowing agent in the production of PU insulation panels at Foshan Refrigeration Equipment General Factory
- (e) Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Guangdong Commercial Refrigeration Equipment Co. (GCREC)
- (f) Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Kaifeng Air Separation Group Ltd (KFAS)
- (h) Conversion to cyclopentane in the manufacture of PU-insulated heating pipes at Tianjin Pipeline Engineering Group Co. Ltd.
- (i) Conversion of refrigerator manufacture in Zhenjiang Radio Factory from CFC-11 to N-pentane foam blowing agent in the production of PU insulation panels

Project Data	Flexible	Rigid						
	Ningbo Yongling	Corrosionproof	Daqing	Foshan	Guangdong (GCREC)	Kaifeng (KFAS)	Tianjin	Zhenjiang
ODS (CFC-11) phase out (ODP tonnes)	72	110	167.8	120.3	69	74	80	120.33
Proposed project duration (months)	36	24	30	36	24	24	24	36
Incremental capital cost (US\$)	600,000	237,600	478,500	636,240	192,500	121,000	659,450	513,700
- including contingency (%)	(84,330)	10	10	10	10	10	10	10
Incremental operational cost (US\$)	9	906,650	646,060	533,206	287,964	779,370	542,438	104,160
Total project cost (US\$)	515,670	1,144,250	1,124,060	1,169,446	480,464	900,370	1,201,888	617,860
Local ownership (%)	100	100	100	100	100	100	100	100
Export component (%)	0	0	0	0	0	0	0	0
Amount requested (US\$) {Original}	448,560	776,110	1,124,060	942,000	472,150	534,090	626,400	659,340
{Revised}								617,860
Cost effectiveness (US\$/kg.)	6.23	7.83	6.70	6.18	7.83	7.83	7.83	5.13
National Coordinating Agency	State Environmental Protection Agency							
Implementing Agency	UNDP			World Bank		UNDP		
Technical review completed?	Yes							
Secretariat's Recommendations								
Amount recommended (US \$)	448,560	776,110	1,124,560	743,500	472,150	534,090	626,400	617,860
Project Impact (ODP tonnes)	72	99.12	167.8	120.3	60.3	68.21	80	120.3
Cost effectiveness (US \$/kg)	6.23	7.83	6.70	6.18	7.83	7.83	7.83	5.13
Implementing Agency support cost (US\$)	58,313	100,894	146,193	96,655	61,380	69,432	81,432	80,322
Total cost to Multilateral Fund	506,873	877,004	1,270,753	840,155	533,530	603,552	707,832	698,182

PROJECT DESCRIPTION

- (a) **Conversion to LCD technology in the manufacture of flexible slabstock polyurethane foam at Ningbo Yongling Rubber & Plastic Co.**
- (b) **Conversion to HCFC-141b in the manufacture of rigid and pour-in-place polyurethane foams at Corrosionproof & Insulation Co., Ltd.**
- (c) **Conversion to HCFC-141b in the manufacture of rigid and spray polyurethane foams at Daqing Petroleum Organization Bureau**
- (d) **Conversion of refrigerator manufacture from CFC-11 to pentane foam blowing agent in the production of PU insulation panels at Foshan Refrigeration Equipment General Factory**
- (e) **Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Guangdong Commercial Refrigeration Equipment Co. (GCREC)**
- (f) **Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Kaifeng Air Separation Group Ltd (KFAS)**
- (h) **Conversion to cyclopentane in the manufacture of PU-insulated heating pipes at Tianjin Pipeline Engineering Group Co. Ltd.**
- (i) **Conversion of refrigerator manufacture in Zhenjiang Radio Factory from CFC-11 to N-pentane foam blowing agent in the production of PU insulation panels**

General

1. CFC consumption in the Chinese foam industry was reported to be 27,540 MT in 1996. CFC-11 was the dominant substance (21,540 tonnes), followed by CFC-12 (6,000 tonnes). Sector consumption data for 1996 indicate that non-appliance foams made up 75 % of that CFC consumption. A total of 7682 tonnes of CFC-11 and CFC-12 is to be phased out from projects approved to date in the foam sector. 2442 ODP tonnes have been phased out. The agencies state that the use of ODS in polyurethane foam is planned to be phased out by 2010.
2. Seven projects to phase out 595.53 ODP tonnes of CFC-11 in the rigid foam sub-sector and one project to phase out 72 ODP tonnes in the flexible slabstock foam sub-sector have been submitted to the 26th Meeting. It is stated that the elimination of the CFC-11 involved is important in helping China meet its obligations with the Montreal Protocol.
3. The enterprises are all 100% Chinese state-owned, except Guangdong Commercial Refrigeration Equipment Co. (GCREC), which is privately owned. All the enterprises started production of foams before July 1995.
4. Four of the companies will convert to the interim use of HCFC-141b with final conversion to ODS-free water-blown technology, two will convert to n-pentane and one will convert to the use of cyclopentane.

Justification for the use of HCFC-141b

5. All the available technologies were evaluated in each project based on their efficiencies and economic trade-offs. The choice of HCFC was based on this evaluation. Some of the reasons given are as follows:

- The interim HCFC solution provides the energy efficiency required, has the lowest investment cost, and is commercially available in China.
- Pentane is not considered because of the higher consumption of foam to obtain the same insulation value as 141b, and to avoid shrinkage; moreover, the existing factory site and the production plant is not suitable for pentane. The change to pentane would require substantial investment up-front in safety equipment and new production units.

6. It is further stated in the projects that the companies are aware that the use of HCFC-141b is an interim technology and accept to bear the cost of conversion to water-blown when this technology becomes mature, or to other permanent ODS-free technology that may emerge.

Flexible Slabstock Foam

(a) Conversion to LCD technology in the manufacture of flexible slabstock polyurethane foam at Ningbo Yongling Rubber & Plastic Co.

7. Yongling was established in 1983. It operates a locally made maxfoam unit installed in 1985. It produced 740 tonnes of low-density foam utilizing 72 tonnes CFC-11. The CFC-11 will be phased out by using liquid carbon dioxide (LCD) technology. The cost of the project includes the cost of LCD equipment (US \$420,000), LCD storage tank CO₂ transfer (US \$25,000) and safety system (US \$35,000), technical support for converting the formulations and process and safety training (US \$10,000) and license fee (US \$50,000). There are incremental operational savings of US \$84,330.

Rigid Foam

(b) Conversion to HCFC-141b in the manufacture of rigid and pour-in-place polyurethane foams at Corrosionproof & Insulation Co., Ltd.

8. Corrosionproof & Insulation Co. Ltd. produces pipe and cold store insulation. It uses one Cannon (Italy) high pressure machine (1985), three low pressure machines: one VEM-DDR-PUR (1982), and two Pump Manufacturing Factory (China) (both 1997). The company also uses two types of high-pressure sprayers, Glas-Craft (1993) and Pump Manufacturing Factory (1993), and one low pressure sprayer from Pump Manufacturing Factory (1994). The company will phase out the use of the 74 tonnes of CFC-11 by converting to HCFC-141b foam system as an interim solution, until full development of the ODS-free water-blown technology. The costs will cover partially (57.6%) the replacement of all sprayers by variable ratio high pressure sprayers and the VEM low pressure dispenser (US\$ 260,000), and the retrofit of the high-pressure dispenser at US\$ 45,000. The replaced equipment will be rendered unusable by October 2000.

Technology transfer, training, and trials, costs amount to US\$ 35,000. The incremental operating costs for two years amount to US\$ 973,398, including the cost of 10% increase in foam density.

(c) Conversion to HCFC-141b in the manufacture of rigid and spray polyurethane foams at Daqing Petroleum Organization Bureau

9. Daqing Petroleum Organization Bureau is engaged in oil and gas exploration activities and produces spray foams and rigid pre-formed pipe sections for oil pipelines and power heating system. The company has four factories which operate seven locally made low pressure machines from which two have a 12 kg/min production rate (1988), and five have a 15 kg/min production rate (all 1987 except one 1983), and four locally made spray foam machines (two are from 1988, and two from 1993). It will phaseout the use of CFC-11 through conversion to HCFC-141b foam system as an interim solution, until the ODS-free water blown technology becomes fully developed. Capital costs include the replacement of the seven low pressure dispensers by high pressure ones at US\$ 315,000, and the retrofit of the four existing low pressure spray foaming machines US\$ 40,000. Training and technical assistance (TTA), namely, Technology transfer, training, and trials amount to US\$ 80,000. The project also includes incremental operating costs (US\$ 732,480) for two years, which includes costs related to 10% increase in foam density for the proportion of pipes with densities lower than 50 kg/m³.

10. The project was deferred from the 25th Meeting to enable outstanding issues to be resolved.

(d) Conversion of refrigerator manufacture from CFC-11 to pentane foam blowing agent in the production of PU insulation panels at Foshan Refrigeration Equipment General Factory

11. Foshan Refrigeration Equipment General Factory produces PU sandwich panels and spray foam. The company operates one Canon H-200 high pressure foaming machine (1987), one locally made and one Gusmer FF-D spray foam machines, 1992 and 1991, respectively. It will phaseout the use of CFC-11 by switching to the use of cyclopentane. Capital costs include the replacement of all three existing production machines and provision of safety equipment at US\$ 503,400, and the retrofit of the four existing low pressure spray foaming machines US\$ 40,000. There is no mention of the fate of the replaced equipment. Training and technical assistance (TTA), namely training, technology transfer and trials, and safety amount to US\$ 75,000. The project also includes incremental operating costs (US\$ 533,206) for two years.

(e) Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Guangdong Commercial Refrigeration Equipment Co. (GCREC)

12. Guangdong Commercial Refrigerator Equipment Co. (GCREC) designs and manufactures cold-store equipment. It currently uses two Wenzhou (China) high pressure machines, both manufactured in 1994, one MEG/MEG MINI low-pressure machine (1987), one locally made double low pressure machine, and one sprayer/pouring unit Gusmer II-III (1986). It will phaseout the use of CFC-11 through conversion to HCFC-141b foam system as an interim solution, until the ODS-free water blown technology becomes fully developed. The project

capital costs will cover partially (86.7%) the replacement of 3 machines (both 1994's and 1987) at US\$ 130,000, and the retrofit of the existing pour-in place foaming machine and the low-pressure machine for lamination and modification of moulds at US\$ 20,000. The replaced machines will be rendered unusable after project completion. Training and technical assistance (TTA), namely training, technology transfer and trials amount to US\$ 35,000. The project also includes incremental operating costs (US\$ 338,904) for two years. There is no mention of an increase in density.

(f) Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Kaifeng Air Separation Group Ltd (KFAS)

13. Kaifeng Air Separation Group Limited (KFAS) specializes in the design and manufacturing of air separation plant, gas liquefaction and cold store equipment. It operates one EMB Puromat 300 (Germany) high pressure machine manufactured in 1986 and one sprayer/pouring unit Glas-Craft (USA) manufactured in 1985. KFAS will phase out the use of CFC-11 through the conversion to HCFC-141b foam system as an interim solution, until the ODS-free water blown technology becomes fully developed. This project will cover partially (53.6%) the costs of the retrofit of the high-pressure dispenser with an added batch type premixer and two new mixing heads at US\$ 67,000, and the replacement of the existing pour-in place foaming machine at US\$ 30,000. The replaced equipment will be rendered unusable after the successful project completion. TTA costs amount to US\$ 35,000. The incremental operating costs for two years amount to US\$ 848,683, related to an increase in density of 10%.

(h) Conversion to cyclopentane in the manufacture of PU-insulated heating pipes at Tianjin Pipeline Engineering Group Co. Ltd.

14. Tianjin Pipeline Engineering Group Co. Ltd. produces polyurethane insulated heating pipes. The company currently operates with two Cannon low pressure machines models C300 and C80. It will phase out the use of 80 tonnes of CFC-11 by converting to cyclopentane. The project will cover partially (51.6%) the costs of the replacement of both low-pressure machines by high pressure ones at US\$ 536,500. Both replaced machines will be rendered unusable after successful project completion. Other capital costs include trials, training, and technology transfer to an amount of US\$ 75,000. The incremental operating costs of US\$ 542,438, related to an increased in density of 20%.

(i) Conversion of refrigerator manufacture in Zhenjiang Radio Factory from CFC-11 to N-pentane foam blowing agent in the production of PU insulation panels

15. Jiangsu Zhenjiang Radio Factory manufactures PU sandwich panels for insulation of telecommunication vehicles. The plant operates one Cannon A-200 high pressure foaming machine, one locally made and one Hennecke spray foam machines. No manufacture dates are provided. The company will phase out the use of the 1 MT of CFC-11 by switching to the use of n-pentane. Project inputs include the replacement of both spray foam machines, the retrofit of the high-pressure machine and provision of safety equipment at US\$ 392,000. The replaced foaming machines will be rendered unusable after successful completion of conversion project. Production trials, training, and technology transfer costs amount to US\$ 85,000. The

incremental operating costs for two years amount to US\$ 136,640, with no mention of density increase.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The projects were discussed with UNDP. Inadequacies identified regarding project presentation were rectified by UNDP. Where necessary, the project documents were revised and resubmitted.

2. In the case of Tianjin Pipeline, it was agreed that the review of available technologies was not complete, since it did not include water-blown technology. UNDP stated that the company selected the cyclopentane technology mindful of the alternative water-blown technology, including their advantages and drawbacks. The project document was however revised to include the alternative water-blown technology.

Ningbo Yangling

3. Errors identified in the calculation of the incremental operational savings particularly regarding incremental maintenance were addressed. This resulted in the amount of US \$84,330 instead of US \$54,443 as originally calculated.

16. The agreed project cost was US \$515,670 with US \$448,560 as the eligible grant.

Rigid Foam

4. The outstanding issue relating to the Daqing Petroleum Organization project was resolved. This related to the extent to which the cost of additional foam for increased density would be applied to the calculation of incremental operational costs. It was agreed to apply 7.5% to 45% of the pipe production which are of low density.

5. The projects were discussed with implementing agencies and the project costs agreed as follows:

	US \$	
Corrosionproof	1,144,550	(eligible grant US \$776,110)
Daqing	1,124,560	
Foshan	743,500	
Guangdong Commercial	480,464	(eligible grant US \$472,150)
KFAS	900,370	(eligible grant US \$534,090)
Tianjin	1,201,888	(eligible grant US \$626,400)
Zhenjiang Radio	617,860	

6. Where foaming machines are older than 10 years, the age discount was considered in calculating the eligible incremental costs.

7. Where HCFC-141b is used and where additional foam is required 7.5% instead of 10% additional foam was used in the calculation of the incremental operational cost.

8. In the case of Corrosionproof the cost of retrofit of the batch premixer was agreed as US \$10,000, instead of US \$20,000.

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the seven projects (Corrosionproof and Insulation Co., Daqing Petroleum, Foshan, Guangdong Commercial, Ningbo Yongling, Tianjin, and Zhenjiang Radio) with the levels of funding and associated support costs indicated in the table below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Conversion to LCD technology in the manufacture of flexible slabstock polyurethane foam at Ningbo Yongling Rubber & Plastic Co.	448,560	58,313	UNDP
Conversion to HCFC-141b in the manufacture of rigid and pour-in-place polyurethane foams at Corrosionproof & Insulation Co., Ltd.	776,110	100,894	UNDP
Conversion to HCFC-141b in the manufacture of rigid and spray polyurethane foams at Daqing Petroleum Organization Bureau	1,124,560	146,193	UNDP
Conversion of refrigerator manufacture from CFC-11 to pentane foam blowing agent in the production of PU insulation panels at Foshan Refrigeration Equipment General Factory	743,500	96,655	World Bank
Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Guangdong Commercial Refrigeration Equipment Co. (GCREC)	472,150	61,380	UNDP
Conversion to HCFC-141b in the manufacture of PU-sandwich panels and pour-in-place polyurethane foams at Kaifeng Air Separation Group Ltd (KFAS)	534,090	69,432	UNDP
Conversion to cyclopentane in the manufacture of PU-insulated heating pipes at Tianjin Pipeline Engineering Group Co. Ltd.	626,400	81,432	UNDP
Conversion of refrigerator manufacture in Zhenjiang Radio Factory from CFC-11 to N-pentane foam blowing agent in the production of PU insulation panels	617,860	80,322	UNDP

SECTOR:	HALON	ODS use in sector (1998):	
		Production:	30,060 ODP tonnes (8,578 MT)
		Consumption:	24,480 ODP tonnes (7,460 MT)
Sub-sector cost-effectiveness thresholds:			1.48 US \$/kg

China Halon Sector Approach, 1999 Annual Programme

Secretariat's Recommendations:	
Amount recommended (US \$)	
Project impact (ODP tonnes)	
Production:	
Consumption:	
Cost effectiveness (US \$/kg)	
Implementing Agency support cost (US\$) *	
Total cost to Multilateral Fund (US \$)	

* The World Bank is requesting a 10 per cent agency fee for this project.

PROJECT DESCRIPTION

China Halon Sector Approach, 1999 Annual Programme

1. The Executive Committee approved the China Halon Sector Plan at its 23rd Meeting contingent upon several conditions (Conditions A through N in decision 23/11). Some of the conditions become applicable beginning with the year 2000 annual programme.
2. China is requesting the release of the second tranche (US \$9.7 million) for the implementation of the 1999 Annual Program in accordance with Condition B of decision 23/11 (Annex I to this document).
3. Condition A requires an annual scheduled reduction in both halon production and consumption for all halons. The objective of the 1999 Annual Program for the Halon Sector is to ensure that the target for halon production is a maximum of 5,970 MT, and halon consumption is a maximum of 5,370 MT per Condition A of decision 23/11.
4. Condition C requires that the payment for the 1999 tranche is conditional upon adequate progress being maintained in phasing out halon in accordance with the schedule in Condition A; however, confirmation of level of consumption in 1998 is required for funding of the year 2000 annual programme.
5. Condition J requires that the agency fee for each annual programme should be agreed between the Executive Committee and the implementing agency. The Bank is requesting the same fee (10 per cent of the total equalling US \$970,000) as was requested for the 1998 annual programme.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The mid-year progress report (Annex I) notes that China has already produced more than half of its 1998 quota of production since its quota system allows plants to produce as they chose up to the annual limit. Enterprises report monthly. As two enterprises had already achieved their annual target by mid-year, those enterprises have suspended their production until next year.
2. A total of nine halon producers received support in 1998. Four received supports on the basis of the resale of part or all of their production quotas; two for partial plant closure and two for total plant closure. The other five enterprises were not producing halon in 1997 (three of these enterprises had no production in 1995 according to the audit report). These five enterprises received closure grants based on their average production during 1994-1997.
3. Only two halon fire extinguisher manufacturers were closed in 1998 representing a phase-out of 385 MT. China approved funds for the conversion and phase-out of halon at another 14 enterprises (representing 2,232 MT) that is expected to be completed at the end of 1999 or the first quarter of the year 2000.

RECOMMENDATION

1. The Secretariat recommends that the Project Review Sub-Committee consider and make recommendations to the Executive Committee on: the mid-year progress report, the 1999 annual programme, and the level of funding for the implementing agency fee in accordance with decision 23/11.

PROJECT EVALUATION SHEET CHINA

SECTOR: REFRIGERATION ODS use in sector (1993): 38.58 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial 15.21 US \$/kg
Domestic 13.76 US \$/kg

Project Titles:

- (a) Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a refrigerant in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory
- (b) Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China

Project Data	Commercial/Domestic	
	Beijing Freezing	Hangli Refrigeration
ODS phase-out (ODP tonnes)	35.25	223
Proposed project duration (months)	24	36
Incremental capital cost (US \$)	215,788	1,230,000
- including contingency (%)	10	10
Incremental operational cost (US \$)	65,113	-
Total project cost (US \$)	280,901	1,230,000
Local ownership (%)	100	70%
Export component (%)	-	-
Amount requested (US \$) {Original}	345,745	1,177,960
{Revised}	280,901	861,000
Cost effectiveness (US \$/kg)	7.97	n.a.
National Coordinating Agency	State Environmental Protection Agency in cooperation with China National Council of Light Industry	
Implementing Agency	UNIDO	
Technical review completed?	Yes	

<i>Secretariat's Recommendations:</i>		
Amount recommended (US \$)	280,901	861,000
Project impact (ODP tonnes)	35.25	n.a.
Cost effectiveness (US \$/kg)	7.97	n.a.
Implementing Agency support cost (US \$)	36,517	111,930
Total cost to Multilateral Fund (US \$)	317,418	972,930

PROJECT DESCRIPTION

- (a) Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a refrigerant in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory**
- (b) Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China**

Background for domestic refrigeration and compressor sub-sectors in China

1. In 1993 ODS consumption in the domestic refrigeration sub-sector was estimated at 8,320 ODP in the Country Programme approved at the 9th Meeting of the Executive Committee in March 1993. There are about 20 compressor plants producing compressors for domestic appliances. 6.22 million refrigerators and 1.88 million freezers were built in China in 1993. The target for complete phase out of CFC consumption in the domestic refrigeration sub-sector in China was 2005. The Executive Committee approved 27 projects in the domestic refrigeration sub-sector, phasing out 8,373 ODP tonnes. 1997 production of compressors was about 7.4 million sets. The Executive Committee approved 7 projects on conversion to non-ODS technologies for major compressor manufacturers in China at US \$9,945,360. The converted production capacity will allow the production of about 9.65 million non-ODS based compressors a year.

- (a) Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a refrigerant in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory**

2. This project represents the reduction of 35.25 ODP tonnes through the replacement of CFC-11 blowing agent with HCFC-141b, and the replacement of the refrigerant CFC-12 with HFC-134a in the production of domestic refrigerators and freezers. This represents about 0.4% of China's CFC-11 and CFC-12 consumption in this sector.

3. The proposal indicates that the project is planned to be completed in November 2000 and thus will assist China to meet its 1999 freeze by phasing out 35.25 ODP tonnes in case the Country would be late in compliance with its obligations.

4. Beijing Freezing Equipment Factory (BFEF) was established in 1958. The company produces a wide range of units, mainly chest freezers, commercial display cases, ice banks, cold stores, and mortuaries. BFEF produced 33,408 units containing CFCs in 1997.

5. The baseline equipment includes: two high pressure foaming machines, four refrigerant charging machines, twelve vacuum pumps, five leak detectors, and other production equipment.

6. The conversion to the refrigeration system requires three new charging boards and the retrofitting of the newest one, new leak detectors, and the retro-fitting of the vacuum pumps.

Funding is requested for the re-design, testing and training required to prove the new designs, and the upgrading of the testing laboratory facilities.

7. The foaming system can be easily modified for use with HCFC-141b. No incremental costs are requested in the foam part conversion.

8. BFEF also has a refrigeration service section; about half of services during the guarantee period are serviced by BFEF technicians; the rest are serviced by outside companies. No incremental costs, however, are requested for servicing operations.

9. Incremental operating costs are requested for a period of six months. These costs include higher prices for components and cost of chemicals associated with new refrigerant and HCFC-141b foam.

10. The proposal states: "BFEF have decided to use HCFC-141b as the foaming agent on both sites. They had originally planned to use Cyclopentane on the Haidian site and HCFC-141b on the West Beijing site which is in a residential area. However, after careful consideration of the costs involved it was decided to employ HCFC-141b as a transitional solution until a non-flammable zero ODS foaming agent becomes available. These substances are currently under development for the US and Japanese markets where the use of flammable blowing agents is not considered acceptable for safety reasons. These foaming agents are expected to be drop-in replacements for HCFC-141b and therefore BFEF will incur no significant further expense when moving to the final zero ODS solution. It was explained to BFEF that no further Montreal Protocol funding would be available for their final transition to a zero ODS foaming agent. They agreed to this."

(b) Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China

11. The proposal covers conversion of the production process of about 1.1 million CFC-12 compressors per year to R-600a isobutane technology. 4% of compressors produced by Hangli were exported to Bangladesh, the UAE and Pakistan in 1997.

12. Hangli Refrigeration Ltd. is a joint venture involving Hong Kong capital (30%). Total grant requested in the project is adjusted to reflect Hong Kong ownership.

13. Required changes to the compressor production process include the redesign of the compressor body and cylinder head. Modifications of the existing design require retooling, replacement of jigs, gauges, fixtures, and casting moulds. A computer numerically control (CNC) machine tool is requested to replace the conventional production equipment for machining connecting rods. It can also be used to machine the cylinder bores. Testing requires the existing calorimeters to be modified. New peripherals for noise measurement, new setups for life, reliability and other tests are also required as part of the conversion. Equipment for production of plastic muffler is requested which is related to improvement of energy efficiency and reduction of noise level. UNIDO indicated that the redesign for energy efficiency is "required by the market". Safety precautions are required in the testing area where the

flammable refrigerant is handled. Helium charging and recovery systems, as well as leak detectors, is included in the requested budget.

14. The list of equipment to be destroyed is provided in the proposal.

15. The cost of technical assistance from a major European R-600a compressor producer is also requested.

16. Incremental operating costs are not claimed.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

(a) Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a refrigerant in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory

1. The proposal is submitted as a domestic refrigeration project. However, an analysis of the list of product manufactured by BFEF revealed that part of the product manufactured by BFEF commercial refrigeration equipment.

2. The strategy on phasing out of CFC-12 in commercial refrigeration subsector was developed by the Government of China. The strategy provides that the total consumption of 13,000 MT of CFC-12 in the commercial refrigeration subsector will be achieved through the funding of conversion of 24 compressor production plants in China. The Executive Committee, noting China's strategy for the commercial refrigeration subsector provided for consolidation of the existing compressor manufacturing industry approved 17 investment projects for conversion of compressor manufacturing facilities and four technical assistant projects to facilitate the phase out of CFC-12 in the commercial refrigeration sector in China. The Government of China is to provide the necessary resources to convert the manufacturers of new commercial refrigeration equipment and the servicing subsector affiliated with the commercial refrigeration equipment.

3. It was thus recognized that cost associated with conversion of the refrigeration part to HFC-134a technology related to production of commercial refrigeration equipment in the project cannot be considered as eligible for funding. The share of commercial refrigeration equipment in total production was estimated to be 12.6%. The level of funding was calculated to reflect this ratio.

(b) Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China

4. The Secretariat discussed with UNIDO the eligibility of requested costs. The eligible incremental cost of new CNC machining tool was estimated at 50% of the requested cost considering the technological upgrade. The requested cost for equipment related to

manufacturing the plastic muffler and the cost of helium leak detection system were recognized as ineligible for funding. The budget was adjusted accordingly.

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the two projects with the funding level and associated support cost as indicated below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Replacement of CFC-11 with HCFC-141b foam blowing agent and CFC-12 with HFC-134a refrigerant in the manufacture of domestic refrigerators/freezers at the Beijing Freezing Equipment Factory	280,901	36,517	UNIDO
Conversion from CFC-12 to isobutane technologies and products at the compressor factory of the Hangli Refrigeration Ltd., in Hangzhou, China	861,000	111,930	UNIDO

PROJECT EVALUATION SHEET **CHINA**

SECTOR: REFRIGERANT (MAC) ODS use in sector (1997): 814 ODP tonnes

Sub-sector cost-effectiveness thresholds: N/A

Project Title:

MAC sector plan

Project Data	MAC Sector
ODS phase-out (ODP tonnes)	n/a
Proposed project duration (months)	36
Incremental capital cost (US \$)	9,177,000
- including contingency (%)	10
Incremental operational cost (US \$)	-
Total project cost (US \$)	49,000,000
Local ownership (%)	100
Export component (%)	-
Amount requested (US \$) {Original}	9,177,000
{Revised}	
Cost effectiveness (US \$/kg)	
National Coordinating Agency	State Environmental Protection Administration (SEPA)
Implementing Agency	World Bank
Technical review completed?	Yes

<i>Secretariat's Recommendations:</i>	
Amount recommended (US \$)	Pending decision by the Executive Committee
Project impact (ODP tonnes)	
Cost effectiveness (US \$/kg)	
Implementing Agency support cost (US \$)	
Total cost to Multilateral Fund (US \$)	

PROJECT DESCRIPTION

MAC Sector Plan

Background

1. In 1995, the Government of China developed a strategy for the phase-out of CFC in the MAC sector. The strategy indicated at that time there were 38 separate manufacturers of MAC components and compressors. Of these enterprises, the Government of China selected 13 enterprises to be converted to HFC-134a technology with financial assistance from the Multilateral Fund.

2. At its 17th and 18th Meetings, the Executive Committee approved US \$6.58 million for China for conversion of 4 of the 13 selected enterprises to be covered under the Multilateral Fund. Subsequently, 3 additional projects related to the conversion of MAC components were submitted to the 23rd Meeting; however, in the light of Decision 17/6 (project proposals in the MAC subsector should emanate from the manufacturers of MAC units themselves, not the manufacturers of component parts) the Committee decided to request the World Bank, the Secretariat and the Government of China to re-examine the projects and resubmit them to a later Meeting.

3. Subsequently, the World Bank prepared a terminal umbrella project covering separate proposals for 9 MAC component manufacturing enterprises and 3 technical assistance programmes, at an overall cost, as prepared, of US \$12.6 million. The preliminary review of the proposal by the Secretariat identified several policy and eligibility issues, *inter alia*:

- (a) Funding of manufacturers of MAC components, contrary to Decision 17/6;
- (b) Compensation for incremental operating costs (calculated at a level of US \$3.45 million), contrary to the recommendations of the World Bank OORG MACs Working Group and to all previous MAC project approvals;
- (c) Compensation for other components that have not been approved for any other MAC project (e.g., hoses and dryers); and
- (d) The size and basic characteristics of the MAC sector in China were not clear. The sector appeared to be developing rapidly, for example, by changing over to the production of MAC components in factories until recently producing components for other industries. Thus, the capacity of the industry which might be eligible for funding was not clear.

4. The project was originally submitted to the 25th Meeting for funding, but it was deferred by the World Bank, since it was seeking a means to brief the Executive Committee on the issues involved and receive any guidance the Committee might consider appropriate so that progress could be made towards approval of a project at a later meeting.

5. The Executive Committee decided, as a special case, that the project might not need to meet the requirements of Decision 17/6 but must fall within the US \$15.15 million estimated by the Government of China to be the total requests from the Multilateral Fund for the entire sector and should not contain proposals for IOC (Decision 25/21).

6. The World Bank has provided the following information in its proposal on a MAC Sector Plan for China.

Size and characteristics of the MAC sector in China

7. The supply of MACs to vehicle builders in the form of a complete unit is very unusual in China (only 5.5% of MAC units are supplied in this way). In most cases, auto makers source individual MAC components directly from several manufacturers rather than purchasing complete systems from separate suppliers.

8. The MAC Sector Plan identifies 38 enterprises, which manufacture and/or assemble components for MAC systems.

9. Among these enterprises, four enterprises (Ek Chor, SAAC, Haohua and Yueyang) have already been converted with assistance received from the Multilateral Fund. Six other enterprises (Liuzhou Yifeng, Dalian Grand Ocean, Beijing Hongda, Tianjin Jindong, Tianjin Sanden and Fuyang Jiangnan) began production after July 1995, thus are not eligible for funding. Five other enterprises (Yantai Denso, Guangzhou Zengcheng Haohua, Yangjiang Baomali, FAW Zexel and Qingdao Goodyear) have already converted to HFC-134a based MAC compressors, systems, and components at their own costs.

10. Therefore, 23 enterprises, which began production before July 1995 will either be converted to HFC-134a technology, merged, or shut down. The basic characteristics of these enterprises are presented in Tables 1 and 2.

11. According to a forecast by the Government of China, production of vehicles with MAC will grow by 25% per annum until 2000, and between 7 and 9% each year beyond 2000. By the year 2000, the demands for CFC-12 in new MAC systems and for servicing existing units have been estimated in 220 and 1,740 tonnes, respectively.

The MAC Sector Plan

12. The World Bank has developed a MAC Sector Plan for China, with the following main objectives (as stated in the proposal submitted to the 26th Meeting):

- (a) support full conversion of the entire MAC industry to non-ODS technology, and meet the target date of 31 December 2001 for CFC phaseout in new MAC production (provided appropriate financial and technical assistance is made available on schedule);

- (b) provide coverage of eligible conversion costs for eligible enterprises in the MAC component sector;
- (c) provide support to technical assistance activities needed to ensure phaseout is complete and successful;
- (d) support policy actions to ensure industry conversion; and
- (e) implement a monitoring and compliance programme.

13. It is stated in the proposal that implementation of MAC Sector Plan will assist China to comply with the 1999 freeze requirements (even if the total sector phaseout will only be completed by 31 December 2001) and will be essential in meeting the 50% CFC reduction target for 2005.

14. In order to ensure that the entire MAC industry in China would be converted to non-CFC technologies in the most cost-effective manner, the Government of China evaluated the following three phase out options:

Option A: Expanding production capacity of the enterprises that have already received assistance from the Multilateral Fund.

This option assumes establishing new production lines at each enterprise to increase capacities to meet the demand for MAC systems in 2001, and closure of all other MAC component manufacturers. The cost for this option was estimated at US \$50 million (including \$24-32 million for new production lines, incremental operating costs, and compensation costs for premature closure).

Option B: Projects emanating from MAC system suppliers (vehicle manufacturers)

This option assumes investment necessary for installing and charging MAC systems at the car manufacturing facilities. Based on cost figures provided by MAC experts, the cost for this option was estimated at US \$44 million (including incremental costs of MAC components and HFC-134a refrigerant).

Option C: Convert the production facilities for different MAC components

This option is based on typical requirements for converting production lines of different various MAC components (compressors, heat exchangers, and hoses). The total cost to convert the current 38 enterprises was estimated at US \$37 million.

15. Based on this analysis, the World Bank has advised that the Government of China concluded that Option C was the most cost-effective approach for both the country and the Multilateral Fund, would ensure a sustainable conversion of the entire MAC industry and would allow the vehicle industry to function according to its strategy and business plan. Furthermore, the Government of China has elected to seek support for component manufacturers rather than

automobile manufacturers because of the structure of its MAC industry. The Sector Plan is based on Option C.

Components of the MAC Sector Plan

16. Consistent with the original (1995) MAC sector strategy and with Decision 25/21, the Government of China is requesting approval of US \$8.57 million as compensation for completion of phase-out as proposed in the Sector Plan, based on Option C. The sum of this figure and the US \$6.58 million previously approved for 4 MAC component manufacturing enterprises, is equal to US \$15.15 million, the amount first proposed in the 1995 MAC sector strategy as compensation for conversion of the sector.

17. To establish a basis for the request of US \$8.57 million, the World Bank has submitted 9 detailed project proposals for MAC component manufacturers (4 for compressors, 3 for heat exchangers and one each for dryers and hoses). The total cost of the 9 projects, as submitted, is US \$8.7 million. The World Bank has also submitted 3 proposals for technical assistance at a total cost of US \$782,800, to promote rapid conversion, to develop new standards and testing requirements and to monitor the CFC phaseout programme. The total overall cost of the 12 proposals is US \$9.848 million (US \$1.28 million above the US \$8.57 million cap required by Decision 25/21).

18. The main cost components of the 9 investment proposals are: equipment and tools related with the manufacture of MAC components, such as oil charging and oil dehydration equipment, piston swaging machine, leak detectors, jigs, dies, fixtures, aqueous based cleaning machines (US \$5.4 million); testing equipment (US \$1.2 million); technology transfer fees requested for 4 enterprises (US \$1.2 million), and; contingency (US \$0.87 million).

19. It is stated in the MAC Sector Plan that an analysis was undertaken of the equipment used by the enterprises involved in the 9 investment proposals to ensure that only equipment items directly related to the use of CFC-12 refrigerant were included. Where any possible question remained in a particular equipment item, a reduction factor of 50% of the cost was applied to more than compensate for multiple use.

20. Incremental operating costs were estimated to be US\$ 4 million (based on the 9 projects). However, the Government of China has not requested these costs (thus complying with Decision 25/21).

21. The main cost components of the 3 technical assistance proposals are: preparation of HFC-134a MAC standards at China Auto Technology and Research Centre (US \$279,800); equipping a national testing facility at Changchun Automobile Research Institute (US \$440,140), and; monitoring CFC phaseout in the MAC industry by the China Institute of Auto Economic and Technical Affairs (US \$60,000).

22. It is noted in the MAC Sector Plan that as there are some 23 pre-1995 enterprises operating in the sector and potentially eligible for conversion, the costs of conversion would be substantially higher than the compensation being requested by the Government of China.

Policy and support measures

23. The Government has already introduced a number of policy measures to provide incentives to the MAC sector enterprises to phase out use of CFC-12. Imports of vehicles equipped with CFC-12 MAC and manufacturing equipment for CFC-12 MAC were subjected to an import ban effective 1 January 1996, and imports of CFC-12 MAC and associated compressors from January 1, 1998.

24. The Government intends to introduce, within the framework of the CFC production sector phaseout program, a production quota system, which will control and gradually reduce the maximum annual production of CFC-12. The Government will also introduce a ban on use of CFC-based MAC. After December 31, 2001, only HFC-134a-based MAC and vehicles equipped with these systems will be eligible for sale and registration.

25. The Government is also planning to reduce or remove import duty on equipment related to projects for phasing out CFC-based MAC production and to provide preferential tax rates for vehicles equipped with HFC-134a-based MAC. Loans may be made available to enterprises that are proposing to convert to non-CFC-based MAC.

Implementation modalities

26. The Government of China is requesting flexibility in project implementation, by introducing a bidding process to provide incentives for MAC component manufacturers. The bidding process will start once the Executive Committee approves funding for implementation of the MAC sector plan. All eligible component manufacturers will be encouraged to participate; bid winners will be selected based on: (a) the most cost-effective proposals; (b) implementation schedules within the proposed phaseout schedule; (c) the conversion will ensure sufficient supply of HFC-134a MAC components to cover the demand for MAC systems in year 2002; and (d) financial viability of the enterprises (if more enterprises can be accommodated within the approved amount for this part of the sector plan, additional enterprises will be included).

27. Bidding procedures will be similar to those used in the Halon Sector Phaseout approach (e.g., selected enterprises will sign contracts with a national implementing agency; procurement will be handled by local procurement agencies and procurement procedures will be similar to halon conversion projects).

28. It is stated in the proposal, that the existing baseline and production capacity of each enterprise would be considered to determine eligible incremental costs. The conversion to HFC-134a technology will not provide enterprises with any technical upgrade, expansion of capacity or other benefits.

29. The World Bank is proposing to disburse funds approved by the Executive Committee for the umbrella project in four installments (25%, 25%, 40% and 10%). Each disbursement would be subjected to compliance with performance indicators that are described in the sector plan document.

30. Implementation arrangements in the sector plan include a penalty mechanism by which enterprises with up to 6 months delay on targets will not receive additional resources until the agreed completion target is met. Enterprises with delays beyond 6 months would be required to stop sales of CFC-based units regardless of impact.

31. The World Bank will supervise overall implementation of the MAC Sector Plan, replenish the local project Bank account and report to the Executive Committee on implementation progress. The Bank would monitor the MAC Sector Plan following agreed performance indicators, with spot checking of progress under the several Plan components (including a survey of the major vehicle manufacturers), ensuring policy actions are implemented according to the agreed schedule to successfully complete the Sector Plan objectives and targets.

32. A detailed system for monitoring MAC sales in the vehicle industry will be included in the implementation manual for the MAC Sector Plan. (the monitoring programme is similar to that being used in the Halon Sector Plan, currently under implementation).

Support costs

33. The World Bank is requesting support costs of 13% of the total grant approved by the Executive Committee.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat's review of the MAC Sector Plan was made in the context of:
 - (a) Relevant decisions by ExCom regarding the MAC sector (Decisions 17/6, 23/28 and 25/21);
 - (b) Strategy study report on CFC phaseout in China's MAC sector, Ministry of Machinery Industry, September 1997;
 - (c) MAC conversion projects approved for China in July 1995;
 - (d) The Fund Secretariat's comments on the MAC projects submitted to the ExCom at its 24th Meeting (please refer to our fax of 2 February 1998);
 - (e) The Revision of the OORG MACs conversion to zero-ODS technology paper (May 1998); and

- (f) Information gathered and discussions held with representatives from the Government of China, MAC-component production facilities and the World Bank during the Secretariat's mission to China (where three MAC component manufacturing plants were visited).

2. The Secretariat also sought technical advice from a MAC industry expert on the requests for new pieces of equipment and/or retrofit of existing equipment and the associated costs.

3. There appears to be no basis in the MAC Sector Plan for identifying and reviewing specific incremental costs for conversion of the remaining parts of the MAC sector in China other than by reviewing the proposed costs for the 12 specific funding proposals associated with it. The Fund Secretariat therefore focussed its review on the information provided in the 12 proposals.

4. The Fund Secretariat and the World Bank discussed in detail the size and characteristics of the MAC sector in China in the context of the rules and policies of the Multilateral Fund. The Secretariat and the Bank also discussed in detail the eligibility of the specific capital equipment items requested in each one of the proposals, and their costs.

5. The total cost of the 9 investment and 3 technical assistance proposals as submitted is US \$9.484 million. The Secretariat concluded that, on a project-by-project basis, US \$7.502 million appeared to be eligible for funding.

Capital equipment items

6. Capital equipment requested in the 9 investment proposals appears eligible for funding, except for the following items, which have a total cost of US \$1.596 million:

Contingency added to technology transfer costs	US \$120,000
Scrap value of equipment to be replaced not deducted	US \$45,000
Foreign ownership component of Yuxin Machinery not deducted	US \$430,000
Replacement of oil charging equipment not essential	US \$440,000
Replacement of equipment not in the baseline	US \$170,000
Replacement of equipment not related to refrigerant	US \$261,000
Contingency (on above items, where applicable)	US \$169,000

7. Subsequently, in detailed technical comments to the Fund Secretariat, the World Bank agreed that US \$0.755 million out of the total of US \$1.596 million might not be eligible but disputed the remainder of the assessment.

Technical Assistance

8. The technical assistance proposals relate to: development of technical standards for HFC-134a MAC systems i.e., refrigerant oil used in HFC-134a systems, assessment procedures for cooling performance of MAC, sealing parts, hoses, and connectors (US \$279,800); establishment of new national testing facilities for HFC-134a MAC equipment and modification to a current

system tester for simultaneous use with CFC-12 and HFC-134a (US \$440,140); and: monitoring CFC phaseout in the MAC industry (US \$60,000).

9. It is to be noted that standards for HFC-134a MAC components and systems have been developed over several years in the United States (through SAE) and in other countries with the participation of representatives from almost every car manufacturer in the world. SAE standards are available at a nominal fee. The development of new standards *ab-initio* would not seem to be an essential part of the conversion process. Similarly, the establishment of HFC-134a related equipment testing facilities at the national level does not appear to be an essential conversion requirement. Notwithstanding the eligibility issue, advice available to the Secretariat indicates that the cost of the relevant equipment for testing facilities should not exceed US \$250,000.

10. Regarding monitoring activities, more than 50% of the request is for computers, software and system development, and the remaining is for travel/DSA, training and labour.

11. Thus, as presented, the request for technical assistance seems largely ineligible. The Executive Committee could consider a component for adaptation of existing standards and for project monitoring at a level of some US \$100,000.

12. However, the Secretariat observes that there is no allowance in 6 of the 9 investment proposals for training at the plant level. Such training is frequently approved projects in other refrigeration sub-sectors and in the foam sector. A provision of around US \$50,000 per enterprise would be consistent with allocations in other approved projects, amounting to US \$300,000 for the six enterprises.

13. On this basis, the total eligible incremental cost for technical assistance could be up to US \$400,000.

Conclusions

14. The proposed MAC Sector Plan is comprehensive and thoroughly documented. It contains proposals intended to ensure phase-out and provides details of the proposed modalities for implementation and disbursement of funds.

15. The World Bank has requested US \$8.57 million to implement the plan. This figure represents the limit of funding established by the Executive Committee in Decision 25/21.

16. In support of this figure the World Bank has submitted 12 investment and technical assistance proposals with a total value as submitted of US \$9.484 million. After acknowledging possible ineligible costs of US \$0.755 million, the value of these 12 proposals remains above the limit of funding.

17. The Fund Secretariat has reviewed the 12 proposals and has assessed the eligible costs at up to US \$7.5 million.

18. The World Bank has advised that it is not able to agree to the level of funding for the Sector Plan as reviewed by the Secretariat and points out that the overall cost to phase out the

sector will be substantially higher than the level of compensation being sought by the Government of China.

RECOMMENDATION

1. The Executive Committee might wish to take note of the above when considering the MAC Sector Plan for China.

Table 1
MAC Component Industry Production Volume

Compressors Produced in 1997		Heat Exchanger produced in 1997		MAC Systems Produced in 1997	
Company	Production	Company	Production	Company	Production
Shanghai EK Chor	360,000	Yueyang Hengli	63,000	Yueyang Hengli	500
Guangzhou Haohua	41,000	Shanghai Wangzong	15,500	Shanghai Wangzong	300
Mudanjiang	51,000	SAAC	258,000	SAAC	1,000
Huada Xexel	25,400	Guangzhou Haohua	5,000	Nanjing Auto	2,000
Jianshe Industries	30,000	Yangling Baomali	2,000	Henan Yuxin	1,000
Yantai DENSO	18,000	Nanjing Auto	1,000	Hefei (16th. Res. Inst)	1,000
Foshan Guangdong	1,800	Henan Yuxin	22,000	Harbin Shan Hang	1,000
Shanxi Hongling	15,300	Hefei (16th. Res. Inst)	1,000	Jiangsu Huaning	200
Liuzou Lifeng	4,000	Hubei Jingsha	47,000	Wengzhou ACF	500
		Dongfeng Pai'en	2,000	Beijing Jinwei	700
		FAW Xexel	27,700		
		Yueyang (J.Jiang'in)	16,500		
		Dalian Grand Ocean	33,000		
		Hangzhou Dongbao	5,000		
		Beijing Hong Da	11,600		
		Shanghai Auto Parts	1,000		
		Tianjin Jin Dong	22,000		
		Tianjin SANDEN	14,000		
		Fuyang Jiangnan	1,000		
TOTAL	546,500	TOTAL	548,300	TOTAL	8,200

Annex II: List of 38 MAC Enterprises of Chinese MAC Sector							
Enterprise	Started	Capacity	Actual Production		Market	Foreign	Technology
	Production		1996	1997	Share in 1997	Ownership	Licenser
I. MAC Compressor Manufacturer							
1 Shanghai Ek Chor	1991	300,000	317,000	360,000	66%	50%	Sandan
2 Guangzhou Panyu Haohua	1992	100,000	20,000	41,000	8%	0%	Sandan
3 Mudanjiang	May-95	200,000	6,800	51,000	9%	0%	Deawoo
4 Huada Zexel	Mar.26, 1994	100,000	21,800	25,400	5%	45%	Zexel, Japan
5 Jianshe Industries	Mar-95	100,000	9,050	30,000	5%	0%	Seiko Seiki
6 Yantai Denso	Nov-95	100,000	3,800	18,000	3%	0%	Nippon Denso
7 Foshan Guangdong	1993	100,000	2,000	1,800	0%	50%	
8 Shaan'xi Hongling	Jan-94	30,000	13,000	15,300	3%	0%	Wankel
9 Liuzhou Yifeng	1996	50,000	50	4,000	1%	0%	
Sub total:			393,500	546,500	100%		
II. MAC Heat Exchanger Manufacturers							
10 Yueyang Hengli	1986	200,000	28,000	63,000	11%	0%	Konvekt & Bock
11 Shanghai Wanzhong	1990	50,000	10,000	15,500	3%	50%	
12 SAAC	1991	300,000	280,000	258,000	47%	0%	Sandan
13 Guangzhou Zengcheng haohua	1993	100,000	2,500	5,000	1%	0%	Sandan
14 Yangjiang Baomali	Feb-95		4,000	2,000	0%	0%	
15 Nanjing Auto	1983	10,000	800	1,000	0%	0%	
16 Henan Yuxin	1994	100,000	10,200	22,000	4%	25%	Dakin, Japan
17 Hefei (16th Research Institute)	Nov-94		800	1,000	0%	0%	
18 Hubei Jingsha	Sep-93	150,000	41,000	47,000	9%	0%	
19 Dongfeng Pai'en	1992	50,000	4,000	2,000	0%	0%	
20 FAW Zexel	1996	100,000	8,000	27,700	5%	0%	
21 Yueyang Jiangyin	Mar-95	100,000	1,000	16,500	3%	0%	
22 Dalian Grand Ocean	Sep-95	50,000	4,500	33,000	6%	0%	
23 Hangzhou Dongbao	1994	50,000	5,000	5,000	1%	0%	
24 Beijing Hongda	Sep-95	75,000	830	11,600	2%	26%	
25 Shanghai Auto Parts	1985	10,000	1,000	1,000	0%	0%	
26 Tianjin Jindong	Jun-96	75,000	9,400	22,000	4%	0%	
27 Tianjin Sandan	Oct-96	75,000	5,400	14,000	3%	50%	
28 Fuyang Jiangnan	Jun-95		1,100	1,000	0%	0%	
Sub total:			417,530	548,300	100%		
III. MAC System Manufacturers							
29 Beijing Jingwei (system component)	Jan-95	5,000	500	700	9%		
30 Harbin Shenhong (system compnt.)	1994	5,000	300	1,000	12%		
31 Jiangsu Huaning (system compont.)	1994	1,000	220	200	2%		
32 Wenzhou ACF (system component)	Mar-95	1,000	500	500	6%		
10 Yueyang Hengli			4,000	500	6%		
18 Hubei Jingsha			5,000	-	0%		
17 Hefei (16th. Research Inst)			800	1,000	12%		
15 Nanjing Auto			800	2,000	24%		
12 SAAC				1,000	12%		
16 Henan Yuxin				1,000	12%		
11 Shanghai Wanzhong				300	4%		
Sub total:			12,120	8,200	100%		
IV. MAC Component Manufacturers							
33 Shanghai Junle (pressure switch)	1993	100,000	5,000	5,000	0%		
34 Qingdao Goodyear (pipes)	Jan-95	1000000m		400,000	0%		Goodyear
35 Nanjing 7425 Factory (hose/pipes)	1994	1600000m	330,000	600,000	20%		Pirelli, Italy
36 Xinchang Sanhua (receiver dryer)	1991	500,000	150,000	303,000	0%		
37 Fuyang Jiangnan	1996	100,000	500	60,000	0%		
38 Suzhou Xinzhi (dryer)	1994	300,000	89,500	217,000	0%		

THE HALON SECTOR

1999 ANNUAL PROGRAM

August 18, 1998

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**THE
1999 ANNUAL PROGRAM****HALON****SECTOR****Background**

In accordance with the Executive Committee approval of the “Sector Plan for Halon Phaseout in China” (UNEP/OzL.Pro/ExCom/23/68), China is hereby requesting release of the second tranche of **US\$9.7 million** for implementation of the 1999 Annual Program. With this funding, China’s halon 1211 production will have to reduce to a maximum of **5,970 MT** and its consumption to a maximum of **5,370 MT** in 1999. The halon 1301 production and consumption will be maintained at the agreed maximum level of 300MT. Details of the annual program is in Section B.

Since the approval of the China Halon Sector Strategy at the 23rd meeting of the ExCom and release of fund for the 1998 Annual Program, China has started implementation of the Halon Sector Strategy. In accordance with 1998 Annual Plan, China has initiated supporting policies, closed seven halon producers completed, partially closed two halon producers, closed two halon fire fighting extinguishers and 14 extinguisher and system manufacturers started conversion activities and all technical assistance activities have also started. The national production quota for 1998 is **7,912 MT**, a reduction of 2,038MT from the 9,950 MT at the start of the phaseout program. Detailed implementation status is described in Section A.

Those results have been achieved through a close cooperation between State Environmental Protection Administration (SEPA), the Ministry of Public Security (MPS) and the fire protection industry. Experiences from the first half year of implementation has also confirmed the necessity of strong policy enforcement and monitoring of the halon phaseout program. Due to the number of enterprises involved and the geographical distribution, the success of the program depend to a large extent on the cooperation and support from the provincial Environmental Protection Bureaus and Fire Fighting Bureaus, hence training and public awareness is a key element.

While halon phaseout is one side of the equation, assured supply of alternative fire extinguishing agents in sufficient quantities and qualities is required. With a decline of halon 1211 supply of more than 30% in 1998 compared to the 1997 production level, special initiatives are required to strengthen the supply of ABC powder and CO₂ cylinders. It will be necessary to focus on supply of alternatives within the flexibility allowed in the Halon Sector Plan. The concern regarding the ability and capacity of the fire extinguisher service sector to service and refill ABC and CO₂ extinguishers has been confirmed and will be addressed at later years.

(b) Part A

(i) 1998 Annual Program Implementation Status

as of August 1998

Phaseout targets and objectives

The phaseout target for the 1998 Annual Program is to reduce halon 1211 production from the level of 9,950 MT to a maximum of **7,912 MT** and consumption to a maximum of **7,160 MT** and to maintain halon 1301 production and consumption remain at the 1996 level of **300 MT**. Compared with the actual 1997 halon 1211 production (11,644 MT) and consumption (10,849 MT), the actual ODP impact of the 1998 Annual program would have been 11,196 MT ODP reduction in production and 11,067 MT ODP reduction in consumption.

A main objective of the Halon Sector Plan is to ensure that the level of fire protection is not compromised through halon phaseout activities and substitutes are available in sufficient quantities and qualities.

Implementation of policy instruments

The key policy instrument in the 1998 Annual Program is the tradable production quota system for the halon 1211 and 1301.

The production quota regulation was effective in December 1997. Meanwhile, the national 1998 halon quota was issued, and each producer was assigned a halon 1211 1998 production quota and one producer was assigned the halon 1301 production quota. Each producer was required to report their production output quarterly to local environmental protection agencies. In the first half of 1998, 4,554.7 MT of halon 1211 and 229MT of halon 1301 have been produced nationally. The data reported by the producers has been verified by SEPA and MPS and found them accurate.

The implementation of the quota system has also been supported fully by MPS. MPS has simultaneously strengthened its enforcement of the regulation on use of halon 1211 fire extinguishers, which further has reduced the demand for halon 1211.

Enterprise-level phaseout activities

Closure of halon production facilities and fire extinguisher manufacturers

Halon producers -- All contracts were signed with bid winners. Total halon 1211 reduction was 2,038 MT from the 9,950 MT level. These producers had stopped halon production on January 1, 1998. Their production facilities were

dismantled and equipment was completely destroyed by March 1998. Up till now, all the closure projects have been jointly verified and accepted by SEPA and MPS.

Conversion of halon fire extinguisher manufacturers

Contracts were signed with sixteen halon extinguisher manufacturers selected through a bidding process with a reduction of halon 1211 consumption of 2616.7 MT. All the conversion projects are in the process of equipment procurement. Details are in Annex II.

Technical Assistance Activities

The qualified institutions and consulting companies have been selected through a bidding process. They will undertake the technical assistance activities. All the TA projects go smoothly and proceed in accordance with the agreed implementation plan. Details are in Annex III.

Special initiatives

The shortage of ABC powder of sufficient quantities and qualities has shown to be a problem. Meanwhile, in the first two implementation years of Halon Sector Phaseout Plan, about 6,000 MT of halon 1211 will be phased out, thus there will be a great demand for halon substitutes in the market. ABC dry powder has been defined as one of the main substitutes. To guarantee fire fighting capacity in China, it is imperative to establish *an* additional ABC powder production line with a capacity of 3000 MT annually. Right now, MPS has initiated feasibility studies and technical investigations, including technical discussions with ABC technology suppliers.

At the same time, the limited production of ABC powder at the Beijing Fire Fighting Agent Factory have been addressed. The problems has been identified as a combination of technical problems (not able to reach full capacity due to technical reasons), market penetration of more costly ABC powder have been more difficult than expected (prices of higher quality ABC powder as compared to existing Chinese ABC and BC powder), and enterprise management. SEPA and MPS are trying to address these issues. It is expected that the first two issues could possibly be solved in 1999, but the management issue may be more difficult.

The need for lightweight high pressure CO₂ cylinders is another concern which will be addressed in the 1999 Annual Program. Currently domestic-made CO₂ fire extinguishers do not meet international standards in terms of production technology and quality of steel. With the increased use of high-pressure steel cylinders, safety in use due to quality and heavy weight need to be addressed. A feasibility study will be undertaken

to examine the possibility to establish a production of light weight CO2 cylinders will be undertaken as part of the 1999 annual program.

Activities to continue from August 1 to December 31, 1998

Implementation of policy instruments

- Production quota system --
 - ⇒ continue to closely monitor halon production and regular reporting from halon producers on their production status;
 - ⇒ to ensure compliance, all halon producers will be visited to avoid production exceeding the assigned quota; and
 - ⇒ to strengthen inspection of the quota regulation.
- Fire code revision for building -- finished by the end of 1997;
- Training for the 1999 bidding will start in September for halon producers and fire extinguishers.
- Local Fire Bureaus and Environmental Protection Bureaus will continue their supervision of the Ban of halon fire extinguishers use in non-essential areas.

Enterprise-level phaseout activities

- Phaseout activities of halon agent producers -- Last tranche of fund will be disbursed to the enterprises in August/September.
- Phaseout activities of halon fire extinguisher and system manufacturers -- Most equipment procurement contracts will be signed by end of 1998, and installation will start. Their implementation progress will be closely monitored by the Domestic Implementing Agency and SEPA.

Technical Assistance Activities

- Continue close monitoring implementation of all TA projects to assure projects are carried out as scheduled.

(ii) PART B

1999 ANNUAL PROGRAM

Objectives

The objectives of the 1999 Annual Program for the Halon Sector are to ensure that the target for halon production at a maximum of **5,970 MT** and a consumption of a maximum of **5,370 MT** are met. The 1999 program will also continue actions taken to

ensure that fire fighting capacity is not undermined, e.g. through insufficient supply of substitutes of satisfactory quality.

China is requesting the release of the approved amount of US\$ 9.7 million for the 1999 Annual Program as agreed in the overall Halon Sector Phaseout Plan. To achieve these goals, following activities are envisaged:

- (a) **US\$4 million** to be used for closing 4-5 halon agent producers;
- (b) **US\$4.5 million** to be used for closing and converting 10-14 fire extinguisher manufacturers;
- (c) **US\$0.34 million** to be used for converting 2-3 fire extinguishing system manufacturers; and
- (d) **US\$0.86 million** to be used for technical assistance activities in order to support the halon phaseout program and ensure that existing fire protection requirements can be met.

Policy instruments during the Year

Policies continue

1. In 1999, the following policies and measures will continue to be implemented by the Government. These policies are considered necessary for the success of total halon phaseout in China.

- (a) Bidding -- The bidding system will continue to be improved based on the experiences gained from the 1998 Annual program. Preparatory work will be finished in the second half of 1998. Bidders with the highest scores will be awarded grant funds after bid evaluation. The Government will sign closure/conversion contracts with the winning enterprises.
- (b) Tradable production quota – Regulation will be implemented as in 1998.
- (c) Strengthening of the Ban on new installation of halon extinguishers for non-essential uses and a gradual tightening of the definition of essential uses --

To support local enforcement of the ban on non-essential uses of halons in the most effective manner, the Government will ensure that:

- SEPA/MPS will disseminate details of the ban to all prospective consumers through various channels (news media, bulletin, propaganda, etc.);

- Local fire bureaus and environmental protection bureaus will jointly inspect consumers on a regular basis. If any consumer is found to be using the newly-installed halon fire extinguishers in non-essential areas, the consumer will be required to change within a definite time.
- Joint inspection teams of the local fire bureaus and environmental protection bureaus will be required to submit regular reports to MPS and NEPA about the situation and measures in implementation of the Ban.
- Strictly control the sales of halon by implementing the project of two demonstration centers and spread the experiences to other provinces in order to reach phaseout goals.

Enterprise-level activities

Through the production quota and bidding systems, bid winners will be granted funds for closure and conversion activities. All contracts for closures are expected to be signed by the end of 1998. Closure projects (for halon agent producers) are expected to take effect from January 1, 1999, and all the closure projects to be completed within the program year. All contracts for conversion projects are expected to be signed in the first three months of 1999 and implementation will start afterwards. Implementation may take longer than a year.

Technical assistance (TA) activities

TA activities envisaged under the Sector Phaseout Plan concentrate on strengthening: (i) the overall institutional framework, (ii) management, monitoring & evaluating capabilities of participating institutions, (iii) technical personnel involved in halon phaseout activities, and (iv) support development and facilitate use of alternative technology. These are essential to the success of the phaseout objectives. Main TA activities in 1999 include:

- 1) ***Halon management Plan - Demonstration centers*** To further strengthen management and supervision of halon usage and recycling, preparation of development of a halon bank and promote public awareness will continue. Local fire fighting bureaus will be encourage to actively cooperate and participate in implementation of various policies and regulations. Therefore, in 1999, Beijing is chosen to be a demonstration center for halon monopoly sales and recycling.
- 2) ***Establishment of demonstrative halon bank*** ---- To gain experience and prepare for the construction of national halon bank, a demonstration project will be initiated. In order to utilize ongoing activities already supported, the provincial demonstration project in Guangdong or Shanghai may be chosen to set up a halon bank for demonstration purpose.
- 3) ***Use of CO₂ as fire extinguishing agent, standards, and test method:***

3.1. Revision of national standard for CO₂ fire extinguishing agent ---- The use of CO₂ as a “clean” fire extinguishing agent and area of application will be expanded greatly in the coming years as a result of the phaseout of halons. The quality of CO₂ fire extinguishers can, however, not meet the technical requirements of the similar type of fire extinguishers in the international market. Therefore, the national standard for CO₂ agent must be revised to control quality of CO₂ used as fire extinguishing agent.

3.2. Test methods and test equipment for CO₂ fire extinguishing agent ---- Since 1980s, production and application of halon fire extinguishers and systems has developed rapidly in China. As halons took over the CO₂ market at that time, production and application of CO₂ fire extinguishers and fire extinguishing systems are comparatively far behind that of halon. With halon phaseout and the use of substitutes, the consumption amount and the production capacity of CO₂ agent will be greatly promoted. Currently, CO₂ extinguishers and CO₂ systems are filled with industrial CO₂ agent without any processing, the quality do not comply with the performance indicators of the same products in international market. As industrial CO₂ constitute a safety hazard, test methods are required to ensure reliable quality of CO₂ in the fire protection industry. The purpose of this TA is to develop the necessary simple standards and test methods.

4) ***CO₂ fire extinguishers and systems:***

4.1. Revision of the design code of CO₂ fire extinguishing system ---- The current design code of CO₂ fire fighting system does not include low pressure CO₂ fire extinguishing system which is a *relative* new substitute technology to China developed abroad in recent years. In a CO₂ fire extinguishing system, CO₂ is stored in liquid form. A low-pressure CO₂ system uses a refrigeration system to cool down the CO₂ storage tank in order to increase storage capacity and reduce pressure. The stored amount of CO₂ agent can be increased significantly in a low-pressure CO₂ system compared to the traditional high pressure CO₂ systems and thereby increase fire fighting capacity reliability and safety of the system. The current CO₂ design code will be revised to standardize the design and installation of all types of CO₂ system in the future.

4.2) Study on scope of use of CO₂ extinguishers ---- Based on the ban of non-essential uses of halon extinguishers, new halon extinguishers can not be installed in non-essential areas. ABC, AFFF and CO₂ extinguishers will be used instead. In order to clearer define the areas in which CO₂ extinguishers can replace halon extinguishers, the scope of use, it is necessary to study and evaluate the application of CO₂ extinguishers in non-essential areas and confirm the scope of use.

4.3) *Study on the standard and test equipment of CO2 extinguishers with light cylinders* ---- The use of CO2 extinguishers will increase significant in the coming years as the main substitute of Halon extinguishers. Conventional cylinders for CO2 fire extinguishers are made of carbon steel with thick walls to resist the high pressure. Due the heavy weight of CO2 cylinders, they can be difficult to handle and the efficiency in extinguishing a fire is greatly influenced. Production and usage of CO2 fire extinguishers cylinders made of lightweight materials is a high priority and will be the main focus of MPS. A feasibility study on the establishment of a production line producing light weight CO2 extinguisher cylinders will be completed in 1998. It is necessary to study national standard and test equipment for light weight cylinders.

- 5) ***Formulation of national standard for HFC227 agent*** ---- Many countries has adopt HFC227 as the substitute for H1301. However, due to the usage of H1301 in China, no system manufacturers can manufacture, supply and install HFC227 system. In order to assure the product quality of Halon substitute and promote the development of substitute, the national standard for HFC227 will be formulated now.
- 6) ***Study on the disposal standard for H1211 extinguishers*** ---- Halon fire extinguishers currently installed in various areas constitute a potential risk for leakage and emission of halon. With a total amount of more than 25,000 MT halon 1211 installed *in existing extinguishers in the market*, recovery from extinguishers could be a very important step in protecting the ozone layer. Due to the extensive use and the large amount of H1211 extinguishers in the society, it is necessary to verify the safety and performance of the installed halon 1211 extinguishers, determine the expected life time of the halon1211 extinguishers and formulate a standard for H1211 extinguishers disposal based on China's real situation.
- 7) ***Training of personnel involved in phaseout activities*** -- In order to implement the phaseout plan effectively, it is necessary to train staff of local environmental protection bureaus, local fire bureaus and halon enterprises. Training is needed to prepare enterprises to bid in the following year, to supervise halon production and consumption, to manage the tradable production quota system, and to learn operating procedures in the halon sector phaseout approach. Meanwhile, in halon sector approach, the financial audit and the performance audit are required, therefore, it is necessary to train audit agencies on the sector approach and the annual plan. This type of training will need to be repeated every year in the first few years of implementation.

5. Supply of substitutes

1. Increase supply of higher quality ABC powder by increase production at the existing production facility (Beijing Fire) and establishment of an ABC dry powder production line with production capacity of 3,000 MT annually.
2. Establishment of a production line producing light CO2 extinguisher cylinders:

As CO2 extinguishers are the main substitute for Halon extinguishers. Currently, the CO2 extinguishers in China are made of carbon steel, which are heavy and hard to be use. Therefore, it is necessary to establish a production line producing light CO2 extinguisher cylinders.

Funding sources for the above two activities: To be financed by China and/or through potential savings when confirmed after the audit for 1998 annual plan.

2. The above policy initiatives, enterprise-level and technical assistance activities are summarized in Table 1 below.

TABLE 1: 1999 ANNUAL PROGRAM

Halon phaseout targets & policy instruments					
	Start of program (MT)	Phaseout Target (MT)	End of program (MT)	Key Actions Required	Key Dates
Halon 1211 Production	7,912	1,942	5,970	1. Closures of halon agent producers 2. Closures of extinguishers manufacturers 3. TA activities to help phaseout	1. Jan-Jun. 1999 2. Jan.-Dec. 1999
o.w. export	752		600		
Consumption	7,160	1,790	5,370	1. Closures of manufacturers and conversion of halon fire extinguishers to non-halon extinguishers	1. Jan -Mar.1999 for closures 2. Mid 1999 for start conversion
Halon 1301 Production	618	0	618	1. Activities to help phaseout.	
Consumption	300	0	300	1.Appropriate TA to help future phaseout.	
Continuation of policy instruments					
Policy Instruments	Actions Required				Key Dates
1. Bidding system	1. Training for the 1999 bidding 2. Bidding started 3. Bidding completed 4. Bid winners awarded for 1999 5. Contracts signing with winners. 6. Implement closure/ conversion contracts. 7. Train enterprises for bid preparation for 2000 bidding				1. Aug./Sept. 1998 2. Oct./Nov. 1998 3. Dec.1998 4. Dec. 1998 5. Dec. 1998 6. Closure -- Jan. to March 1999. Conversion-starting Jan. for a 12-24-month period 7. Mid- 1999
2. Tradable production quota for halon producers	1. Establish 1999 halon production quota ; 2. Issue 1999 production quota to halon producers for 1999				1. Dec. 1998 2. Dec. 1998
3. The ban on halon extinguisher uses in non-essential areas	1. Promotional campaign on the ban, through various channels; 2. Joint supervision of ban by local Fire Fighting Bureaus and Envir. Protection Bureaus.				1. Through 1999 2. Through 1999

TABLE 1: 1999 ANNUAL PROGRAM (CONT')

Enterprise-level Activities						
	Funding Requested (US\$ mill)	Existing enterprises	# of enterprise targeted	# of enterprises at end of 1999	Key Actions Required	Key Dates
1. Closure of halon agent producers	4	7	4-5	5-6	Selection through bidding process	1. Bid winners announced Dec. 98 2. Contracts signed Dec. 1998 3. Completed no later than June 99
2. Closure & conversion of halon extinguisher manufacturer	4.5	57	10-14	43 -47	Selection through bidding process	1. Bid winners announced Nov. 98. 2. Contracts signed no later than Dec. 1998 3. Completed in 12-24 months
3. Conversion of halon fire extinguishing system manufacturers	0.34	21	2-3	18-19	Selection through bidding process	1. Bid winners and contracts signed no later than Dec. 1998 2. Completed in 12-24 months
Subtotal	8.84					
TECHNICAL ASSISTANCE ACTIVITIES						
Activities	MLF funding requested. (US\$'000)		Actions Required		Key Dates	
1. Halon management plan establishment of demonstration centers	50		Choose one demonstration center (Beijing) to implement the plan		1. Started preparatory work in mid-1998. 2. Start operational in mid-1999.	
2. Establishment of demonstrative halon bank	80		Choose one demonstration center to implement the plan		1. Contract signed no later than 1Q 1999. 2. To be completed in 12-24 months	
3. Study of CO ₂ agent and its test method						
3.1) Revision of national standard for CO ₂ fire extinguishing agent	58		Selection of qualified institutions to revise standards		1. Contract signed no later than 1Q 1999. 2. To be completed in 12-24 months	
3.2) Study on test method and test equipment for CO ₂ fire extinguishing agent	62		Selection of qualified institutions to undertake study		1. Contract to sign no later than 1Q 1999 2. To be completed in 12-24 months.	

TABLE 1: 1999 ANNUAL PROGRAM (CONT')

TECHNICAL ASSISTANCE ACTIVITIES			
Activities	MLF funding requested (US\$'000)	Actions Required	Key Dates
4) Study on CO2 fire extinguishers and systems			
4.1) Revision of the design code of CO ₂ fire extinguishing systems	104	Selection of qualified institutions to revise design code	1. Contract signed no later than 1Q 1999. 2. Finish work within 12-24 months.
4.2) Study on the scope of use of CO ₂ extinguishers	100	Selection of qualified institutions to define the area using CO ₂ extinguishers	1. Contract to sign no later than 1Q 1999 2. To be completed 12-24 months
4.3) Study on the standard and test method of CO ₂ extinguishers with light cylinders	83	Selection of qualified institutions to undertake study	1. Contract to sign no later than 1Q 1998 2. To be completed 12-24 months
5) Formulation of national standard for HFC227 agent	93	Selection of qualified institutions to formulate national standard	1. Start no later than 1Q 1999 2. Finish work within 12-24 months.
6) Study on the disposal standard for H1211 extinguishers	100	Selection of qualified institutions to undertake study	1. Contract to sign no later than 1Q 1999 2. To be completed 12-24 months
7) Training	50		Training will be carried out through the 1999.
8) International consultants	80	International consultants will be recruited by SEPA to help local consultant firms to study, design and revise standards, codes, etc. Appointments dates will be throughout 1999.	
Subtotal	860		
TOTAL for phaseout activities	9,700		

Table II: 1999 Annual Program - Proposed Performance Indicators

Halon Phaseout Targets				
Halon sector	Start of program (MT)	Phaseout Target (MT)	End of program (MT)	Performance Indicators
Halon 1211				
Production	7,912	1,942	5,970	• Production levels (national aggregate)
o.w. exports	752		600	
Consumption	7,160	1,790	5,370	• Consumption levels (production plus imports minus exports)
Halon 1301				
Production phase-out target	618	0	618	• Production levels (national aggregate)
Consumption phaseout target	300	0	300	• Consumption levels (production plus imports minus exports)
Continuation of Policy Instruments				
Initiatives		Performance Indicators		
Bidding system		• bidding for 1999 annual plan • Winning enterprises for 1999 selected • Enterprises trained for bid preparation for 2000 bidding		
Tradable production quota for halon producers		• Annual production quota to halon producers for 1999 issued • Production reports from enterprises received		
The ban on halon extinguisher uses in non-essential areas		• Promotional campaigns on the ban undertaken; • Local Fire Fighting Bureaus and Environment Protection Bureaus engaged in overseeing ban enforcement.		
Enterprise-level activities				
Activities	Funding requested (US\$mill)	Existing Enterprises	# of enterprises at end of 1998	Performance Indicators
Closure of halon agent producers	4	7	5-6	• Number of ODS reduction contracts signed for closure • Number of closures completed
Closure & conversion of halon extinguisher manufacturer	4.5	57	43	• Number of ODS reduction contracts signed for closure or conversion • Number of closures completed • Number of conversions completed and implementation progress
Conversion of halon fire extinguishing system manufacturers	0.34	21	19	• Number of ODS reduction contracts signed for conversion • Number of conversions completed and/or implementation progress
Subtotal	8.84			Total disbursement to enterprises

TABLE II: 1999 ANNUAL PROGRAM - PROPOSED PERFORMANCE INDICATORS (CONT')

Technical assistance activities		
Activities	Amount in US\$'000	Performance Indicators
1. Halon management plan – establishment of demonstration center	50	Same for all TA contracts-
2. Establishment of demonstrative halon bank	80	
3. Study of CO2 agent and its test method		Date of invitation sent
3.1 Revision of national standard for CO2 fire extinguishing agent	58	Date of bidding
3.2 Study on test method and test equipment for CO2 fire extinguishing agent	62	Date of bid awards
4. Study on CO2 fire extinguishers and systems		Contract amounts
4.1 Revision of design code of CO2 extinguishing systems	104	Date of contract signing
4.2 Study on the scope of use of CO2 extinguishers	100	Starting date of contracts
4.3 Study on the standard and test method of CO2 extinguishers with light cylinders	83	Implementation schedule
5. Formulation of national standard for HFC227 agent	93	Implementation progress
6. Study on the disposal standard for H1211 extinguishers	100	Completion date of contracts
7. Training	50	Disbursements to different activities
8. International consultants	80	Training dates
		Training participants
		Date of invitation sent
		Date of contracts
		Contracts dates and amounts
		Date of completion of works
Subtotal	860	
TOTAL for Phaseout Activities	\$9.7million	

Table III

CHINA															
Halon Sector Phaseout Action Plan, January 1,1998 to January 1,2010															
		First Stage			Second Stage					Third Stage					Total Funding Request
Year	Base line production	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Halon 1211 (MT)															
Production target	9,950	7,960	5,970	3,980	3,317	2,654	1,990	1,990	1,990	0	0	0	0	0	
o.w. Export		800	600	400	200	100	100	100	0	0	0	0	0	0	
Import		0	0	0	0	0	0	0	0	0	0	0	0	0	
Domestic Consumption		7,160	5,370	3,580	3,117	2,654	1,890	1,890	1,990	0	0	0	0	0	
Production phaseout target		1,990	1,990	1,990	663	664	664	0	0	1,990	0	0	0	0	
Consumption phaseout target		1,790	1,790	1790	463	564	764	0	0	1,990	0	0	0	0	
Halon 1301 (MT)															
Production target ^{3/}	750	750	750	750	750	600	600	600	600	150	150	150	150	0	
o.w. Export		450	450	450	450	450	450	450	450	50	50	50	50	0	
Import		0	0	0	0	0	0	0	0	0	0	0	0	0	
Domestic Consumption		300	300	300	300	150	150	150	150	100	100	100	100	0	
Production phaseout target		0	0	0	0	150	0	0	0	450	0	0	0	150	
Consumption phaseout target		0	0	0	0	150	0	0	0	50	0	0	0	100	
Required funding from MLF (\$'000) (NPV in 1997 constant \$)		13,113	9,692	9,645	5,160	3,382	7,157	2,028	1,951	941	523	296	258	116	62,702
Funding request from MLF ('000) (PV of each year, in 1997\$)		13,113	10,661	11,671	6,868	4,952	11,527	3,592	3,802	20,177	1,234	772	735	363	89,448
of which, TA activities		1,550	900	930	980	840	700	560	560	420	420	280	140	140	8,400

ANNEX 1

19. Closures of halon production facilities and lines in the 1998 Annual Program

Table 1: Closure of Halon 1211 Plants with 1998 Production Quotas

Name of the plant	Halon phaseout (MT)	Closure date	Implementation status	Remarks
1.Zhedong No.1 Chemical Plant	347	January 1, 1998	Project completed	Plant closure
2.Zhejiang Dongyang No.2 Chemical Plant	1,004	January 1, 1998	Project completed	Plant closure
3.Zhejiang Xiaoshan Fire-fighting Chemical Plant	387	January 1, 1998	Project completed	Partial closure. One out of two production plant closed.
4.Foshan Electro-Chemical General Plant	300	January 1, 1998	Project completed	Partial closure. Reactor pipes dismantled.
Total (Quotas sold back to Gvt.):	2,038			

Table 2: Closure of Halon 1211 plants not assigned 1998 production quotas

Name of the plant	Halon phaseout (MT)	Year of stop production	Implementation status	Remarks
1.Dalian Fire-extinguishing Agent Plant	165.9	1997	Equipment dismantled completely	Dismantling and destruction of equipment verified
2.Zigong Fujiang Chemical Plant	54.0	1997	Equipment dismantled completely	Dismantling and destruction of equipment verified
3.Guangdong Dongguan Fire-fighting Equipment Plant	320.0	1997	Equipment dismantled completely	Dismantling and destruction of equipment verified
4.Guangxi Beihai Ocean Chemical Plant	40.0	1997	Equipment dismantled completely	Dismantling and destruction of equipment verified
5.Wenling Salt Farm Chemical Plant	70.5	1997	Equipment dismantled completely	Dismantling and destruction of equipment verified
Total	650.4			

ANNEX II

List of beneficiary fire extinguisher manufacturers in the 1998 Annual Program

Name of the manufacturer	Project starting date	Phaseout amount (MT)	Implementation Status	Planned completion date	Remarks
1.Zhejiang Xiangshan No.1 Fire-fighting Equipment Plant	1998.03.14	223.0	The dismantle of the equipment has started.	1998.10.31	Plant closure
2.Zhejiang Yiwu Fire-fighting Extinguisher Plant	1998.03.14	162.2	The dismantle of the equipment has started.	1998.12.31	Plant closure
3.Changzhou Fire-fighting Equipment Plant	1998.03.14	47.5	The procurement of the equipment has started.	1999.12.31	Conversion
4.Dalian Jinzhou Fire-fighting Equipment Plant	1998.03.14	105.7	The procurement of the equipment has started.	1999.11.30	Conversion
5.Guangxi Wuzhou Fire-fighting Equipment Plant	1998.03.14	52.4	The procurement of the equipment has started.	1999.12.31	Conversion
6.Guangzhou Zhujiang Fire-fighting Equipment Plant	1998.03.14	138.4	The procurement of the equipment has started.	1999.10.30	Conversion
7.Jiangxi No.1 Fire-fighting Equipment Plant	1998.03.14	220.8	The procurement of the equipment has started.	2000.01.30	Conversion
8.Nanjing Heli Fire-fighting Equipment Plant	1998.03.14	146.4	The procurement of the equipment has started.	1999.12.31	Conversion
9.Ningxia Yongning Fire-fighting Equipment Plant	1998.03.14	23.0	The procurement of the equipment has started.	1999.09.30	Conversion
10.Panyu Shengjie Fire-fighting Equipment Plant	1998.03.14	435.1	The procurement of the equipment has started.	2000.01.30	Conversion
11.Shanghai Haishen Fire-fighting Equipment Plant	1998.03.14	149.6	The procurement of the equipment has started.	2000.03.01	Conversion
12.Shanghai Punan Fire-fighting Equipment Plant	1998.03.14	268.4	The procurement of the equipment has started.	2000.01.30	Conversion
13.Shanghai Qingpu Fire-fighting Equipment Plant	1998.03.14	169.9	The procurement of the equipment has started.	1999.12.31	Conversion
14.Shenyang Fire-fighting Equipment Plant	1998.03.14	153.7	The procurement of the equipment has started.	1999.10.30	Conversion
15.Xiangshan Fire-fighting Equipment Plant	1998.03.14	270.6	The procurement of the equipment has started.	1999.08.30	Conversion
16.Ningbo Sanyou Fire-fighting Equipment Ltd.	1998.03.14	50.0	The procurement of the equipment has started.	1999.06.30	System conversion
Total (Average halon 1211 consumption 1995 to1997):		2,616.7			

ANNEX III

20. Implementation of Technical Assistance Activities in the 1998 Annual Program

Name of TA Projects	Implementing Agencies	Contract Date	Implementation Status	Planned Completion Date	Remarks
1.Revision of Standards for ABC Powder	Tianjin Fire Research Institute	1998.04.28	Certain tests have been finished; Related materials have been collected.	2000.12.31	
2.Design Codes for Gaseous Fire Extinguishing Systems	Tianjin Fire Research Institute	1998.04.28	Certain test device has been installed; Related materials have been collected.	2000.01.31	
3.Standards for Components of Gaseous Fire Extinguishing Systems	Tianjin Fire Research Institute	1998.04.28	Outline of the standards has been formulated.	2000.02.28	
4.Halon Management Plan-Overall Management	Shanghai Fire Research Institute	1998.04.28	Table for the survey has been designed; Assumption model has been designed.	1999.12.31	
5.Halon Management Plan-Training Courses and Propaganda Materials	Shanghai Fire Research Institute	1998.04.28	The outline of the training materials has been compiled.	2000.06.30	
6.a) Halon Management Plan-Provincial Promotions and Demonstration Centers	Shanghai Fire Fighting Bureau	1998.04.28	1) Selection of demonstrative service center has started; 2) All related policies have been analyzed.	1999.10.31	
6.b) Halon Management Plan-Provincial Promotions and Demonstration Centers	Guangdong Fire Fighting Bureau	1998.04.28	1)a series of local policies have been formulated; 2)Selection of the service center has started.	1999.08.31	
7.Development of halon Management Database and Data collection System	Qinghua University	1998.04.28	The preliminary design of the system has been done.	1998.09.28	
8.Management Information System	Qinghua University	1998.04.28	The system is in operation now.	1998.04.02	
9.Training	SEPA		Two training workshops have been conducted	1998.12.10	
10. Export/Import	Beijing University	1998.08 (planned)			

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Annex III

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