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EXECUTIVE COMMITTEE  
OF THE MULTILATERAL FUND FOR THE  
IMPLEMENTATION OF THE MONTREAL PROTOCOL  
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Montreal, 24-26 March 1999

**PROJECT PROPOSALS: CHINA**

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

Foam

- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Chengdu Jinjiang Foam General Plant World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Handan Fuyang Chemical Corporation World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Henan Huojia Huashi Co. World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Jiangsu Haimen Foam plant World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Putuo Zhujiajian Rubber and Plastic Plant World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Shanghai Shenyin Polyurethane Baoshan Plant World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology at Shenyin Polyurethane Xinzhuang Plant World Bank
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Xiaoshan Polyurethane Foam Plant World Bank
- Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Nanjing Kanglian Industrial Corporation World Bank
- Phaseout of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Qingdao Changlong Commercial Machinery Co. Ltd. World Bank
- Phaseout of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Shanghai Haiou Electric Appliance General Factory World Bank
- Phaseout of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Zhenjiang Commercial Refrigeration Equipment General Plant World Bank

Refrigeration:

- Phasing out ODS at the Beijing Embraco Snowflake Compressor Co. Ltd. (BESCO) UNIDO domestic refrigeration compressor factory

**PROJECT EVALUATION SHEET  
CHINA**

SECTOR: FOAM ODS use in sector (1997): 23,900 ODP tonnes

Sub-sector cost-effectiveness thresholds: Flexible Slabstock US \$6.23/kg

**Project Titles:**

- (a) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Chengdu Jinjiang Foam General Plant.  
 (b) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Handan Fuyang Chemical Corporation.  
 (c) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Henan Huojia Huashi Co.  
 (d) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Jiangsu Haimen Foam Plant.  
 (e) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Putuo Zhujiajian Rubber and Plastic Plant.  
 (f) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shanghai Shenyin Polyurethane Baoshan Plant.  
 (g) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shenyin Polyurethane Xinzhuang Plant  
 (h) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Xiaoshan Polyurethane Foam Plant.

Project Data	Flexible							
	Chengdu Jinjiang	Handan Fuyang	Henan Huojia	Jiangsu Haimen	Putuo Zhujiajian Rubber	Shanghai Shenyin Polyurethane	Shenyin Polyurethane Xinzhuang	Xiaoshan Polyurethane
ODS (CFC-11) phase out (ODP tonnes)	89	70	109.5	73	112	76	86.1	111
Proposed project duration (months)	36	36	36	36	36	36	36	36
Incremental capital cost (US\$)	616,500	616,500	616,500	616,500	616,500	616,500	616,500	616,500
- including contingency (%)	10	10	10	10	10	10	10	10
Incremental operational cost (US\$)	19,704	60,043	(33,314)	127,281	(91,017)	31,334	22,721	(13,442)
Total project cost (US\$)	636,204	676,543	583,186	743,781	525,483	647,834	639,221	603,058
Local ownership (%)	100	100	100	100	100	100	100	100
Export component (%)	0	0	0	0	0	0	0	0
Amount requested (US\$) {Original}	554,470	436,100	682,185	454,790	525,483	473,480	536,403	691,530
{Revised}			583,186					603,058
Cost effectiveness (US\$/kg.)	6.23	6.23	5.33	6.23	4.69	6.23	6.23	5.43
National Coordinating Agency	State Environmental Protection Administration (SEPA)							
Implementing Agency	IBRD							
Technical review completed?	Yes							
<b>Secretariat's Recommendations</b>								
Amount recommended (US \$)	554,470	436,100	583,186	454,790	525,483	473,480	536,403	603,058
Project Impact (ODP tonnes)	89	70	109.5	73	112	76	86.1	111
Cost effectiveness (US \$/kg)	6.23	6.23	5.33	6.23	4.69	6.23	6.23	5.43
Implementing Agency support cost (US\$)	70,992	56,693	75,814	59,123	67,803	61,552	69,004	76,336
Total cost to Multilateral Fund	625,462	492,793	659,000	512,913	593,286	535,032	605,407	679,394

## PROJECT DESCRIPTION

- (a) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Chengdu Jinjiang Foam General Plant (Jinjiang).**
- (b) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Handan Fuyang Chemical Corporation (Fuyang).**
- (c) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Henan Huojia Huashi Co (Huojia).**
- (d) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Jiangsu Haimen Foam Plant (Jiangsu).**
- (e) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Putuo Zhujiajian Rubber and Plastic Plant (Zhujiajian).**
- (f) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shanghai Shenyin Polyurethane Baoshan Plant.**
- (g) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shanghai Shenyin Polyurethane Xinzhuang Plant (Xinzhuang).**
- (h) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Xiaoshan Polyurethane Foam Plant (Xiaoshan).**

### Sector Information

1. Baseline consumption (average 1995-1997) of Annex A Group I substances (CFCs) reported to the Ozone Secretariat: 57,522.3 ODP tonnes.
2. Information from the inventory of approved projects shows that as of November 1998 US \$45.19 million had been approved for projects in the foam sector to phase out 10,025 ODP tonnes of Annex A Group I substances. US \$14.57 million had been disbursed and 2,442 tonnes of the controlled substances had been phased out.
3. The World Bank reported in the sector background information that the updated China Country Programme showed that the foam industry consumed 23,900 tonnes CFCs in 1997, of which 72% was CFC-11 and 28% was CFC-12. It was also reported that 260,000 tonnes foams was produced in that year, of which 54% was flexible foam, using 27% of the CFC, and 27% and 19% were rigid foam and polyethylene/polystyrene foams using 46% and 28% respectively of the CFC.
4. The World Bank also provided tables showing major rigid foam and flexible slabstock foam manufacturers funded under its programme from July 1994 – July 1998 and their status of implementation. These include four rigid foam and 15 flexible foam manufacturers with total CFC consumption of 766 ODP tonnes and 1,571 ODP tonnes respectively. Four of the projects – one rigid and three flexible were expected to be completed by December 1998 to phase out 335 ODP tonnes CFC. There is no indication of how these projects will impact the stated consumption of China for the various foam sectors.

### Impact of the Projects on the Country's Montreal Protocol Obligations

5. It is stated that, compared to the 1997 CFC consumption, China will have to reduce its consumption by approximately 5,000 tonnes to meet the 1999 freeze requirement. Eliminating CFC consumption in the foam sector, which currently constitutes 33.7% of the country's CFC consumption, is essential. These projects will assist China in meeting the target and help China keep the consumption below the freeze level.
6. However taken against the baseline, 727 ODP tonnes of CFC to be phased out in the eight flexible slabstock foam projects will eliminate about 1.3% of China's baseline CFC consumption.

### Description of the Projects

7. Projects have been submitted for eight flexible slabstock foam producing enterprises in China. All the enterprises manufacture foam for furniture applications except Xiaoshan which produces foam used by loud speaker manufacturers and Zhujiajian that produces for use in fishing boats and the furniture industry. CFC consumption of the enterprises targeted to be phased out is shown in the table of the project evaluation sheet. All the enterprises have one maxfoam machine each except Huojia and Xiaoshan which have two each.
8. The enterprises produce flexible slabstock foam ranging in densities from 10 kg/m<sup>3</sup> to 38 g/m<sup>3</sup>. Several of the low density foam types contain auxiliary blowing agent (CFC-11) much higher than usually known to be used in similar foam production, while high density foams normally blown without CFC reported as containing some amounts of CFC.
9. All the enterprises will phase out CFC-11 using liquid carbon dioxide technology. The capital cost in each case includes the cost of LCD system (US \$350,000), high pressure pump (US \$70,000) and CO<sub>2</sub> bulk storage and transfer system (US \$50,000). Other costs include licensing fee (US \$50,000), trials and technical assistance (US \$35,000) and building modification (US \$10,000).
10. In addition to these capital costs US \$150,000 is included in the capital costs of Huojia and Xiaoshan for retrofit of one foam tunnel each from fixed to variable width tunnels.
11. The project cost of all of the companies except Huojia and Zhujiajian include incremental operational costs ranging from US \$19,700 to US \$127,280, partly due to low prices of the blowing agent in the country and partly to higher cost in yield losses resulting from inclusion of high density foam in the calculation. Huojia and Zhujiajian have incremental operational savings of US \$33,334 and US \$91,017 respectively.

### Equipment to be destroyed or rendered unusable

12. The World Bank reported that the enterprises will dispose of the old raw material supplying systems and control panels and will not use any ODS after completion of the project. A list showing the equipment to be destroyed was included in the project document. These include various pumps, control panel, mixing heads and troughs.

## SECRETARIAT S COMMENTS AND RECOMMENDATIONS

### COMMENTS

1. The cost of retrofit of the tunnel of US \$150,000 was agreed as ineligible incremental capital cost. The incremental operational costs and savings were recalculated based on prices used for the projects submitted for the World Bank's 1998 business plan, since the projects completed the 1998 business plan. This resulted in increased incremental operational savings. However this did not affect some of the projects where costs remained above the threshold. The World Bank and the Secretariat agreed on all the project costs. The project documents have been revised by the World Bank as necessary.

### RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the eight flexible slabstock foam projects with the funding levels and associated support costs indicated in the table below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Chengdu Jinjiang Foam General Plant.	554,470	70,992	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Handan Fuyang Chemical Corporation.	436,100	56,693	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Henan Huojia Huashi Co.	583,186	75,814	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Jiangsu Haimen Foam Plant.	454,790	59,123	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Putuo Zhujiajian Rubber and Plastic Plant.	525,483	67,803	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shanghai Shenyin Polyurethane Baoshan Plant.	473,480	61,552	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shenyin Polyurethane Xinzhuang Plant	536,403	69,004	IBRD
Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Xiaoshan Polyurethane Foam Plant.	603,058	76,336	IBRD

**PROJECT EVALUATION SHEET  
CHINA**

SECTOR: FOAM ODS use in sector (1997): 23,900 ODP tonnes

Sub-sector cost-effectiveness thresholds: Rigid US \$7.83/kg

**Project Titles:**

- (a) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Nanjing Kanglian Industrial Corporation.
- (b) The phase out of CFC-11 in the manufacture or rigid polyurethane foam through the use of HCFC-141b at Qingdao Changlong Commercial Machinery Co. Ltd.
- (c) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Shanghai Haiou Electric Appliance General Factory.
- (d) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Zhenjiang Commercial Refrigeration Equipment General Plant.

Project Data	Rigid			
	Nanjing Kanglian	Qingdao Changlong	Shanghai Haiou	Zhenjiang Commercial
ODS phase-out (ODP tonnes)	30	61.7	36.8	34
Proposed project duration (months)	30	36	36	36
Incremental capital cost (US \$)	115,500	126,500	148,500	71,500
- including contingency (%)	10	10	10	10
Incremental operational cost (US \$)	216,500	362,924	251,660	73,876
Total project cost (US \$)	332,000	489,424	400,160	145,376
Local ownership (%)	100	100	100	100
Export component (%)	0	0	0	0
Amount requested (US \$) {Original}	234,900	451,791	261,052	172,876
{Revised}	234,900	451,791	261,052	145,376
Cost effectiveness (US \$/kg)	7.83	7.83	7.83	5.61
National Coordinating Agency	State Environmental Protection Administration SEPA			
Implementing Agency	UNDP	IBRD		
Technical review completed?	Yes	Yes		

<b>Secretariat's Recommendations:</b>				
Amount recommended (US \$)	234,900	451,791	261,052	145,376
Project impact (ODP tonnes)	30	57.7	33.34	30.81
Cost effectiveness (US \$/kg)	7.83	7.83	7.83	4.72
Implementing Agency support cost (US \$)	30,537	58,733	33,937	18,899
Total cost to Multilateral Fund (US \$)	265,437	510,524	294,989	164,275

## PROJECT DESCRIPTION

- (a) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Nanjing Kanglian Industrial Corporation.**
- (b) The phase out of CFC-11 in the manufacture or rigid polyurethane foam through the use of HCFC-141b at Qingdao Changlong Commercial Machinery Co. Ltd.**
- (c) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Shanghai Haiou Electric Appliance General Factory.**
- (d) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Zhenjiang Commercial Refrigeration Equipment General Plant.**

### Sector Information

1. For the sector background information, please see paragraphs 1 to 4 in the flexible slabstock foam evaluation document.

### Impact of Projects on the Country's Montreal Protocol Obligations

2. The Kanglian project is submitted by UNDP while Qingdao Haiou and Zhenjiang are submitted by the World Bank. Neither agency related the impact of the projects to China's baseline Annex A Group I consumption. Both agencies indicated that when the projects are implemented as scheduled, the CFC consumption eliminated from the foam sector which currently constitutes 33.7% of the country's CFC consumption, will help China keep its consumption below freeze level.
3. The duration of UNDP's project is 2 ½ years, while for the World Bank projects it is 3 years. The four projects will eliminate 51.85 ODP tonnes which constitutes 0.3% of China's baseline consumption of 57,722 ODP tonnes.
4. There will be a residual ODP of 10.65 ODP tonnes as a result of the use of HCFC-141b by three of the four enterprises.

**(a) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Nanjing Kanglian Industrial Corporation.**

5. This project will phase out 30 tonnes of ODP at Nanjing Kanglian Industrial Corporation ("Kanglian"), a 100% state owned Chinese enterprise. Under the project, Kanglian will eliminate the use of CFC-11 in the production of cold storage by switching to the use of water blown technology. The project will cover partially (70.8%) of the total cost of replacement of spray foam machines (US \$75,000), training and technology transfer, testing and pilot scale production (US \$30,000), and incremental operating cost for two years (US \$216,500).

**(b) The phase out of CFC-11 in the manufacture or rigid polyurethane foam through the use of HCFC-141b at Qingdao Changlong Commercial Machinery Co. Ltd.**

6. This project will phase out 57.7 tonnes of ODP at Qingdao Changlong Commercial Machinery Co. Ltd. ("Qingdao"), a 100% state owned Chinese enterprise. Under the project,

Qingdao will eliminate the use of CFC-11 in the production of cold storage by switching to the use of HCFC-141b. The project inputs include retrofitting of existing production equipment (US \$15,000), replacement of two low pressure spray foam machines with high pressure ones (US \$50,000) and installation of a new premixer (US \$30,000). Other capital costs include trials, technology transfer and training (US \$25,000). Incremental operating cost for two years amounts to US \$362,924.

#### Justification for the Use of HCFC-141b

7. The following information (paragraphs 8-11) is provided in the project document.
8. Qingdao has been fully informed of all the above available technologies for substituting CFC-11 in the manufacturing of rigid PU insulation foam for cabinet uses.
9. Qingdao has evaluated the various options at hand. Hydrocarbon is not seen as a solution due to safety and cost considerations. The estimated costs of changing to pentane would be US\$ 400,000 – US\$500,000. Switching to water-blown has also been considered by the enterprises, but has been rejected on technological reasons, e.g. insulation performance of the end product and lack of experience in the Chinese market on water-blown technology for rigid PU insulation foam.
10. Based on the above, the plant has selected HCFC-141b as a substitute. The enterprise has been informed that HCFC-141b is a transitional substance and has a residual ODP of 0.11 (115 of CFC-11) and will be phased out in the future. The enterprise has also been informed that, under the present rules and guidelines of the Multilateral Fund, no additional funding can be provided for the final conversion to a non-ODS.
11. Plans for conversion to a non-ODS was discussed with the plant. However, the enterprise has not considered any plans or time frame for later conversion to a non-ODS and will await the future development in the market.

#### **(c) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Shanghai Haiou Electric Appliance General Factory.**

12. This project will phase out 33.34 tonnes of ODP at Shanghai Haiou Electric Appliance General Factory (“Haiou”), a 100% state owned Chinese enterprise. Under the project, Haiou will eliminate the use of CFC-11 in the production of commercial freezers and cold storage by switching to the use of HCFC-141b. The project inputs include retrofitting of existing production equipment (US \$10,000), replacement of the mixing head (US \$20,000), replacement of three existing spray foam dispensers with high pressure dispensers (US \$75,000) and installation of a new premixer (US \$30,000). Other capital costs are trials, technology transfer and training (US \$30,000).

#### Justification for the Use of HCFC-141b

13. The following information concerning justification (paragraphs 14-17) is provided.



14. Haiou has been fully informed of all the above available technologies for substituting CFC-11 in the manufacturing of rigid PU insulation foam for freezer cabinet uses.

15. Haiou originally planned to convert to hydrocarbon for the foam part and developed a project thereafter. However, the costs of converting to hydrocarbon turned out to be in the around 1 million US\$. As this would require substantial financing from the enterprise, the enterprise was not willing to adopt hydrocarbon as a solution. Switching to water-blown was also considered by the enterprises, but was rejected on technical reasons, e.g. insulation performance of the end product, additional operational costs, and lack of experience in the Chinese market with water-blown technology for rigid PU insulation foam.

16. Based on the above, the plant has selected HCFC-141b as substitute. The enterprise has been informed that HCFC-141b is a transitional substance and has a residual ODP of 0.11 (11% of CFC-11) and will be phased out in the future. The enterprise has also been informed that, under the present rules and guidelines of the Multilateral Fund, no additional funding can be provided for the final conversion to a non-ODS.

17. Plans for conversion to a non-ODS was also discussed with the plant. However, the enterprise has not yet considered any plans or time frame for a later conversion to a non-ODS and will await the future development in the market.

**(d) The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Zhenjiang Commercial Refrigeration Equipment General Plant.**

18. This project will phase out 30.81 tonnes of ODP at Zhenjiang Commercial Refrigeration Equipment General Plant (“Zhenjiang”), a 100% state owned Chinese enterprise. Under the project, Zhenjiang will eliminate the use of CFC-11 in the production of commercial freezers and cold storage by switching to the use of HCFC-141b. The capital costs of the project include replacement of the mixing head (US \$20,000), retrofit of foam dispensers and mould stations (US \$15,000), installation of a new premixer (US \$30,000), trials, technology transfer and training (US \$25,000). Incremental operating cost for two years is calculated to be US \$73,876.

Justification for the Use of HCFC-141b

19. The project document states as follows (paragraphs 20-23):

20. Zhenjiang has been fully informed of all the above available technologies for substituting CFC-11 in the manufacturing of rigid PU insulation foam for cabinet uses.

21. Zhenjiang has evaluated the various options at hand. Pentane is not seen as a solution due to safety and cost considerations. The estimated costs of changing to pentane would be US\$ 400,000-US\$ 500,000. Switching to water-blown has also been considered by the enterprises, but has been rejected for technological reasons, e.g. insulation performance of the end product, additional operational costs and lack of experience in the Chinese market on water-blown technology for rigid PU foam.

22. Based on the above the plant has selected HCFC-141b as the substitute. The choice is based on technical grounds, insulation values of HCFC-141b blown foam and costs. The enterprise has been informed that HCFC-141b is a transitional substance and has a residual ODP of 0.11 (i.e. 115 of CFC-11) and will, as a controlled substance under the Montreal Protocol, be phased out in the future. The enterprise has also been informed that, under the present rules and guidelines of the Multilateral Fund, no additional funding can be provided for a future conversion to a non-ODS substance.

23. Future plans for conversion to a non-ODS was discussed with the enterprise. However, the enterprise has not considered any plans or time schedule and will await future development in the foam market and possible new blowing agent substitutes.

#### Equipment to be destroyed or rendered unusable

24. Both UNDP and World Bank provide tables in the project documents indicating equipment to be destroyed. These are for Nanjing and Haiou, three spray foam machines each, and for Qingdao and Zhenjiang one mixing head each.

## **SECRETARIAT S COMMENTS AND RECOMMENDATIONS**

### **COMMENTS**

#### Nanjing Kanglian

1. The project's costs have been agreed between UNDP and the Secretariat.

#### Qingdao, Haiou and Zhenjiang

2. Since these companies do not have premixers in the baseline the installation of a new premixer after conversion (for US \$30,000) is not an eligible incremental capital cost. The revision to the incremental capital costs as a result of the ineligibility of the cost of the premixers affected the project costs of only Zhenjiang, since the project costs of the two other enterprises are above the threshold. The costs of the projects have been agreed between the World Bank and the Secretariat.

## RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the four projects Nanjing Kanglian, Qingdao, Haiou and Zhenjiang with the funding levels and associated support costs indicated in the table below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Nanjing Kanglian Industrial Corporation.	234,900	30,537	UNDP
The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Qingdao Changlong Commercial Machinery Co. Ltd.	451,791	58,733	IBRD
The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Shanghai Haiou Electric Appliance General Factory.	261,052	33,937	IBRD
The phase out of CFC-11 in the manufacture of rigid polyurethane foam through the use of HCFC-141b at Zhenjiang Commercial Refrigeration Equipment General Plant.	145,376	18,899	IBRD

**PROJECT EVALUATION SHEET  
CHINA**

SECTOR: REFRIGERATION ODS use in sector (1993): 1,750 ODP tonnes

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

**Project Titles:**

(a) Phasing out ODS at the “BESCO” Domestic Refrigeration Compressor Factory in Beijing, China.

Project Data	Domestic
	BESCO
ODS phase-out (ODP tonnes)	280
Proposed project duration (months)	6
Incremental capital cost (US \$)	3,608,100
- including contingency (%)	0
Incremental operational cost (US \$)	0
Total project cost (US \$)	3,608,100
Local ownership (%)	63
Export component (%)	2-3
Amount requested (US \$) {Original}	2,273,103
{Revised}	
Cost effectiveness (US \$/kg)	N/A
National Coordinating Agency	State Environmental Protection Agency (SEPA) in cooperation with China National Council of Light Industry (CNLI)
Implementing Agency	UNIDO
Technical review completed?	Yes

<b>Secretariat s Recommendations:</b>	
Amount recommended (US \$)	
Project impact (ODP tonnes)	
Cost effectiveness (US \$/kg)	
Implementing Agency support cost (US \$)	
Total cost to Multilateral Fund (US \$)	Pending

## PROJECT DESCRIPTION

### (a) **Phasing out ODS at the BESCO Domestic Refrigeration Compressor Factory in Beijing, China.**

#### Domestic Refrigeration Compressor Sector in China

2. There are about 20 compressor plants in operation in China with a production in 1997 of about 7.4 million units.
3. The Executive Committee approved US \$10.9 million for the conversion of 8 of these plants to non-ODS technology. The combined annual production capacity of these plants after conversion will be 10.75 million compressors.

#### Background of BESCO

4. UNIDO has submitted a project requesting retroactive funding for the 1998 conversion of the BESCO compressor factory to HFC-134a technology.
5. UNIDO provided the following background information in the project document:
  - (a) The Beijing Embraco Snowflake Compressor Co. started operation in 1987 with a design capacity of 1,400,000 compressors/year. After successful start-up and several years of growth the company started to face various difficulties. The enterprise did not meet either the designed capacity or the growing and changing expectations of the market. There were serious quality problems related to the products and the operation was suspended at the end of 1994.
  - (b) In April 1995 the Company was transformed into a Joint Venture between Beijing Snowflake Compressors Company (40%), Embraco, Brazil (55.2%) and Whirlpool, USA (4.8%), with a registered capital of US\$ 44.55 million.
  - (c) After the establishment of the Joint Venture the enterprise was totally reorganised and the staff was retrained to meet the requirement of a modern compressor manufacturer. The production resumed only at the end of 1995. Since the second half of 1996 the production level and productivity have been steadily growing and the company is currently operating in 3 shifts every day and produces at the level of 1.2 million units/year which represents approximately over 10% market share. BESCO exports to Brazil (20,452 units in 1997) and to Whirlpool India (19,434 units in 1998).

- (d) In 1997 BESCO decided to introduce CFC-free compressors. Thus, with the assistance of Embraco Brazil the products have been redesigned. In order to avoid replacement of the available very expensive machining centres the basic compressor design was not changed, however various modifications were made in the design of numerous parts and components.

6. UNIDO also stated that the project was completed by end 1998 and thus it contributes to the freeze target of the country by phasing out the mentioned ODP amount, in line with SEPA's ODS phase out programme.

## **SECRETARIAT S COMMENTS AND RECOMMENDATIONS**

### **COMMENTS**

1. BESCO's production of 856,328 units of CFC 12 compressors was suspended at the end of 1994.
2. The production of CFC-12 compressors was resumed under the new joint venture arrangement at the end of 1995 and increased from 114,165 units in 1995 to about 1 million units of CFC-12 compressors in 1998. This production is expected to reach 1.4 million units in 1999.
3. It appears that no conversion of CFC-12 technology has taken place. Instead, parallel production of HFC-134a compressors commenced in late 1998.
4. No information is provided in the project document about the proposed level of production of HFC-134a compressors in 1999 and future years, nor about the phase-out of production of CFC-12 compressors.
5. Based on the above the eligibility of the request for retroactive funding is doubtful.

### **RECOMMENDATION**

1. The Executive Committee may wish to consider the eligibility of the project for retroactive funding.