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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Fortieth Meeting
Montreal, 16 -18 July 2003

PROJECT PROPOSALS: D.P.R. KOREA

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

Refrigeration

• Refrigerant management plan: prepare and promulgate new legislative provisions and regulation for RMP implementation	UNEP
• Refrigerant management plan: training programme on refrigeration service practices	UNEP
• Refrigerant management plan: customs training	UNEP
• Refrigerant management plan: monitoring the activities in the RMP	UNEP
• Refrigerant management plan: national programme for recovery and recycling of CFC-11 and CFC-12 refrigerant	UNIDO
• Sectoral phase-out in domestic refrigeration sector by conversion of refrigeration and compressor manufacture at 5th October Electronic and Automation Company (first tranche)	UNIDO

Solvent

• Plan for phase-out of CTC in the cleaning solvent sub-sector	UNIDO

PROJECT EVALUATION SHEET
D.P.R. KOREA

SECTOR: Refrigeration servicing ODS use in sector (2002): 243 ODP tonnes

Sub-sector cost-effectiveness thresholds: n/a

Project Titles:

(a) Refrigerant management plan: prepare and promulgate new legislative provisions and regulation for RMP implementation
(b) Refrigerant management plan: training programme on refrigeration service practices
(c) Refrigerant management plan: customs training
(d) Refrigerant management plan: monitoring the activities in the RMP
(e) Refrigerant management plan: national programme for recovery and recycling of CFC-11 and CFC-12 refrigerant

Project Data	**Refrigerant management plan**				
	legislation and regulations	**refrigeration training**	**customs training**	**monitoring**	**recovery and recycling**
Enterprise consumption (ODP tonnes)					243
Project impact (ODP tonnes)					243
Project duration (months)	18	36	21	36	36
Initial amount requested (US $)	30,000	166,250	115,000	28,200	837,944
Final project cost (US $):					
Incremental capital cost (a)					774,582
Contingency cost (b)					63,362
Incremental operating cost (c)					
Total project cost (a+b+c)	30,000	166,250	115,000	28,200	837,944
Local ownership (%)	100%	100%	100%	100%	100%
Export component (%)	0%	0%	0%	0%	0%
Amount requested (US $)	30,000	166,250	115,000	28,200	837,944
Cost effectiveness (US $/kg.)					
Counterpart funding confirmed?					
National coordinating agency	National Coordinating Committee for Environment				
Implementing agency	UNEP	UNEP	UNEP	UNEP	UNIDO

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

PROJECT DESCRIPTION

Background

1. The D.P.R. Korea country programme update was submitted for the consideration of the Executive Committee at its 40th Meeting (UNEP/OzL.Pro/ExCom/40/47), together with a refrigerant management plan (RMP) project proposal.

2. In 2002 and 2003, a survey was conducted in D.P.R. Korea by local experts for the preparation of the country programme update and the RMP project proposal. The results of the survey were supplemented by visits to main cities during the mission of consultants from UNEP and UNIDO in early December 2002 and March 2003. UNEP and UNIDO staff members also visited D.P.R. Korea twice to develop the RMP and assist in the completion of the CFC phase out strategy.

3. In 2002, the total production of ODSs in D.P.R. Korea was 2,326 ODP tonnes which was at the same level as the ODS consumption (i.e., 2,326 ODP tonnes). Of the total amount of ODSs produced and consumed, 299 ODP tonnes were CFC-11 and CFC-12 used in the refrigeration manufacturing (56 ODP tonnes) and servicing (243 ODP tonnes) sub-sectors, and 2,027 ODP tonnes were CTC used as a solvent, process agent and fumigant.

Refrigeration sector

4. Most of the requirements of CFC refrigerants in D.P.R. Korea are met through local production. Small amounts of CFC are sometimes imported. The distribution of CFCs in the refrigeration sector is shown in the following table.

Sub-sector	ODS	Application	1995	1996	1997	2000	2001	2002
Domestic	CFC-11	Manufacturing	-	31.0	-	12.0	31.0	37.0
	CFC-12	Manufacturing	-	16.5	-	5.4	18.8	17.0
		Servicing	133.3	110.0	112.0	24.0	136.2	145.6
Commercial	CFC-12	Manufacturing	0.2	3.5	-	2.6	2.2	2.0
		Servicing	42.4	-	10.0	5.5	30.9	22.7
Industrial	CFC-11	Manufacturing	-	-	-	-	-	-
		Servicing	50.2	19.0	40.0	11.0	25.0	27.0
	CFC-12	Servicing	-	-	-	4.5	5.3	4.5
MAC	CFC-12	Servicing	270.4	15.0	11.0	-	43.6	43.2
Total	CFC-11		50.2	50.0	40.0	23.0	56.0	64.0
	CFC-12		446.3	145.0	133.0	42.0	237.0	235.0
	CFCs		496.5	195.0	173.0	65.0	293.0	299.0

5. D.P.R. Korea manufactures CFC-based domestic and commercial refrigeration equipment, and compressors at one enterprise (October 5th Automation Complex) with a reported production capacity of 100,000 units/year. The CFC consumption in the refrigeration manufacturing sub-sector ceased completely in 1997. In 1999, due to slow economic recovery, production of refrigeration equipment restarted. A project proposal for the conversion of the

refrigeration manufacturing enterprise to non-CFC technologies has also been submitted to the 40th Meeting.

6. Based on the 2002-2003 survey, there are about 2.9 million units of refrigeration equipment in the country, with the following distribution by type of equipment:

Type of equipment	**Units**
Domestic refrigerators	2,489,000
Freezers	82,670
Ice cream machines*	287,400
Water coolers	24,100
Centrifugal chillers	1,076
Bottle coolers	10,180
Food display cabinets	2,425
Hotel freezers	1,821
Cold storage	3,840
Total	**2,902,512**

*As reported in the original project proposal.

7. More than 90 per cent of the total refrigeration equipment is domestic refrigerators, with an average estimated lifetime of 20 years. Commercial refrigeration equipment is primarily found in major cities. The number of vehicles fitted with a MAC system is not very high; most of the recently imported vehicles are fitted with HFC-134a MAC systems; some of the older vehicles are equipped with CFC-12 based MAC systems and they are expected to be in use for a few more years. There are about 1,076 chillers operating with either CFC-11 or HCFC-22 refrigerants. The industrial refrigeration equipment in food processing and fishing industries is based on either ammonia or HCFC-22 refrigerants.

8. The refrigeration servicing sub-sector consists of 191 registered workshops. The total work force of the refrigeration servicing sector is about 2,500 persons, among which 550 are technicians. These registered workshops service all types of refrigeration equipment including those operating with ammonia or HCFC-22. During the 2002-2003 survey, it was found that:

(a) Most of the workshops are small and medium in size;

(b) About 80 per cent of domestic refrigerators and all MAC units are serviced in workshops; 20 per cent of domestic refrigerators are serviced in situ; and

(c) The workshops do not have leak-detectors and recovery/recycling equipment. In only 20 per cent of the workshops refrigerants are recovered using a compressor; recovered refrigerants are re-filled directly into the system without cleaning.

9. The majority of the servicing technicians are trained in formal schools/institutes (from 6 months to 3 years, depending on the needs and requirements of each individual and workshop managers).

10. In order to meet domestic demand for ODS alternatives, the Research Centre for Environment Protection of D.P.R. Korea developed a new refrigerant ('Moran') produced from propylene as a CFC-12 replacement in domestic refrigerators.

11. The current prices of CFC-11 and CFC-12 (which are totally produced in the country) are US $1.30/kg and US $1.70/kg, respectively, while the price of HFC-134a is US $2.80/kg.

ODS regulations

12. Implementation of the RMP will be based on existing and new regulations, including:

(a) Ban on the manufacture, installation, and/or import/export of CFC-based refrigeration equipment from 1 January 2005;

(b) Conversion of CFC-based refrigeration equipments to non-CFCs from 1 July 2006 (provided that the Executive Committee approves for funding the phase out investment project submitted to the 40th Meeting);

(c) Ban on the manufacture and/or import/export of CFC-based compressors from 2004;

(d) Ban on imports of CFCs, halons, TCA, CTC, and MB and exports of CFC-11, CFC-12 and CTC from 1 January 2007;

(e) Reduction of import duties for CFC and/or HCFC recycling units; and

(f) Compulsory licensing/certification of refrigeration service workshops and technicians to service CFC-based refrigeration equipment, to be enforced once the training of refrigeration technicians is completed, and recovery and recycling units are deployed.

Sub-projects within the RMP and costs

13. The total cost of the RMP project proposal is US $1,296,994, and consists of the following sub-projects:

(a) Regulation preparation and implementation (US $30,000): to draft and implement an ODS import/export licensing system, including monitoring procedures; reviewing ODS regulations, incentive schemes, policies on tariffs and customs regulations; controlling the number of refrigeration equipment, promoting the use of drop-in substitutes; and conducting awareness activities;

(b) Training for refrigeration servicing technicians (US $166,250): to provide training on good servicing practices, refrigerant containment and recovery/recycling operations; and to provide basic training equipment for the training schools;

(c) Training for customers officers (US $115,000): to introduce relevant ODS regulations and provisions, to control import/export of ODSs and ODS-based

equipment; to enforce the import quota system (to be established with the RMP implementation); and to provide training on ODS identification;

(d) Establishment of a CFCs recovery and recycling network (US $937,544): including 166 capacity recovery machines; 498 sets of 23 kg cylinders; 25 recovery and recycling machines; 250 sets of 50 kg cylinders; 25 sets of refrigerant identifiers; and 25 sets of 900 kg refrigerant storage tanks. Training in recovery/recycling operations is also included; and

(e) Monitoring the sub-projects in the RMP (US $28,200): to ensure effective implementation of the RMP.

14. The implementation of the RMP project will gradually phase out 243 ODP tonnes of CFCs used in the refrigeration servicing sub-sector according to the Montreal Protocol phase out schedule.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

CFC baseline

15. The CFC compliance baseline for D.P.R. Korea calculated by the Ozone Secretariat is 441.7 ODP tonnes. The 2002 CFC consumption reported by the Government under Article 7 was 299 ODP tonnes (56 ODP tonnes for equipment manufacturing and 243 ODP tonnes for servicing).

16. The maximum level of CFC eligible for funding (under Decision 35/57) for D.P.R. Korea is 291.7 ODP tonnes, which is 70.8 ODP tonnes above the 50 per cent CFC Montreal Protocol phase out reduction.

Substitute production

17. The Secretariat noted that the RMP proposal did not address technical, safety and cost-related issues associated with the proposed use for the hydrocarbon-based refrigerant ("Moran"), locally developed by the Research Centre for Environment Protection, as a CFC replacement in domestic refrigerators. UNEP and UNIDO responded that the information related to the new refrigerant was provided by the Government to reflect its effort in searching for new alternatives to CFCs refrigerants. However, the new refrigerant has not yet been proven to be a commercially viable alternative.

Technical and cost-related issues

18. The Secretariat requested further information and/or clarification from UNEP and UNIDO on the following technical and cost-related issues regarding the RMP project proposal:

(a) The sharp increase in CFC consumption from 65 ODP tonnes in 2000 to 451 ODP tonnes in 2001 (a 450 per cent increase);

(b) The rationale used for estimating the number of refrigeration equipment in the country, taking into consideration the production capacity of the refrigeration manufacturing plant, the current economic difficulties in the country and the economic trade limited to a few countries. For example, of the 2.49 million refrigerators and 92,000 ice cream machines in D.P.R. Korea (287,400 units in the original project), only 0.43 million refrigerators and 2,093 ice cream machines were locally produced. Also, the countries of origin of the 100,000 CFC-based MAC units in the country taking into consideration that production of these units in countries with economic trade with D.P.R. Korea was very small;

(c) According to the RMP project proposal, legislation/regulations, including licensing system, have yet to be drafted. On the basis of Decision 38/38, the customs training programme and the recovery and recycling programme could not commence until relevant ODS regulations are drafted and measures had been taken to ensure that the local market of CFCs and non-ODS refrigerants are similar (the price of CFC-12 is US $1.70/kg, compared to US $2.80/kg for HFC-134a);

(d) The basis for requesting of 211 refrigerant handling machines and related equipment is questionable, taking into account that 90 per cent of the refrigeration systems are domestic refrigerators, that the amount of CFC-12 used for servicing MAC units will disappear in a few years, and that experience about approved recovery/recycling projects indicate that little, if any, CFC-12 is ever recovered from domestic refrigerators;

(e) A justification for the request for a training programme on recovery/recycling operations (US $77,600) within the recovery/recycling programme in addition to the training programme for servicing on refrigeration servicing practices (US $166,250);

(f) A justification for the request of 50 ODS identification kits (already reduced from 70 units in the original project proposal), taking into consideration that since 1998, only 30 ODP tonnes of CFC-12 were imported into the country, and import of CFC-based equipment appeared to be very small; and

(g) The basis for the costs associated with the organization of workshops for servicing technicians (US $87,250) and custom officers (US $40,000) taking into account that the majority of the servicing technicians are trained in formal institutes; and the high costs for publication of training documents (US $15/unit).

19. Justification for the request of US $22,000 for monitoring and evaluation within the refrigeration and customs training programmes in addition to US $28,200 for monitoring the activities in the RMP.

20. The outcomes of the discussion between the Secretariat and UNEP and UNIDO will be communicated to the Executive Committee prior to its 40th Meeting.

PROJECT EVALUATION SHEET
D.P.R. KOREA

SECTOR: Refrigeration ODS use in sector (2002): 299 ODP tonnes

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

Project Titles:

(a) Sectoral phase-out in domestic refrigeration sector by conversion of refrigeration and compressor manufacture at 5th October Electronic and Automation Company (first tranche)

Project Data	**Domestic**
	5th October
Enterprise consumption (ODP tonnes)	56.0
Project impact (ODP tonnes)	56.0
Project duration (months)	36
Initial project cost (US $)	1,425,511
Initial amount requested (US $)	500,000
Final project cost (US $):	
Incremental capital cost (a)	1,176,000
Contingency cost (b)	113,600
Incremental operating cost (c)	75,411
Total project cost (a+b+c)	1,365,011
Local ownership (%)	100
Export component (%)	0
Amount requested (US $)	500,000
Cost effectiveness (US $/kg.)	10.10*
Counterpart funding confirmed?	Yes
National coordinating agency	National Coordinating Committee for Environment (NCCE)
Implementing agency	UNIDO

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

* The cost-effectiveness is calculated only for the refrigerator manufacturing sub-project taking into account a 35% safety discount.

PROJECT DESCRIPTION

Sector background

- Latest available total ODS consumption (2002) 2,326.00 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs) 441.67 ODP tonnes
- Consumption of Annex A Group I substances for the year (2002) 299.00 ODP tonnes
- 2002 Consumption of CFCs in refrigeration sector (manufacturing) 56.00 ODP tonnes
- 2002 Consumption of CFCs in refrigeration sector (servicing) 243.00 ODP tonnes

21. Information regarding the refrigeration sector in the Democratic People's Republic of Korea (D.P.R. Korea) is provided in the project proposal. Additional information is available in the 1996 Country Programme submitted at the 21st Meeting of the Executive Committee and in the Country Programme Update, which is submitted for consideration by the 40th Meeting of the Executive Committee.

22. The CFC consumption in the refrigeration sector in D.P.R. Korea was 299 ODP tonnes including 56 ODP tonnes of CFC-11 and CFC-12 for manufacturing of domestic and commercial refrigeration equipment and 243 ODP tonnes for servicing domestic appliances, commercial and industrial refrigeration equipment and mobile air-conditioners. The Government of D.P.R. Korea decided to address CFC consumption in the refrigeration sector through two projects for conversion of refrigerator and compressor manufacturing facilities and through a refrigeration management plan with investment and non-investment components.

23. The production of the refrigeration equipment is centralized at the 5th October Electronics and Automation Complex which manufactures two models of domestic refrigerators, hermetic compressors and a variety of commercial refrigeration equipment such as water coolers, ice makers and display cabinets. According to the project document, the production equipment was installed in 1992-1994. Annual production capacity is 100,000 units in one shift. The country programme contains information on production of CFC-12 based refrigerators starting from 1989. The historical records of production levels at the enterprise are shown below.

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997-99	2000	2001	2002
Production (units)	113,652	n.a.	63,956	35,128	15,872	2,356	0	82,500	0	32,500	83,750	85,000

24. The country programme indicates that reduction in production levels from 1991 to 1994 was concurrent with attempts to develop an alternative refrigerator using ammonia as a refrigerant. However, the attempt was not successful.

25. The proposal covers the conversion of production of domestic and commercial refrigeration equipment as well as the production of compressors. Since these enterprises are the only remaining manufacturers of refrigeration equipment in D.P.R. Korea, the Government submitted the proposal as a sector phase out plan in the domestic refrigeration sector with the funding requirements and CFC phase out targets according to the table below.

Year	2003	2004	2005	2006	Total
ODS phase out (ODP tonnes)	0	6	18	32	56
Funding required (excluding agency support cost) US$	500,000	537,500	31,913	0	1,069,413

26. The baseline equipment consist of one cabinet (18 jigs) and one door (15 jigs) foaming lines, two foam dispensers, a pre-heating oven and a premixing plant. All foaming equipment is locally built. The refrigerant part includes two locally-made refrigerant charging machines, 47 vacuum pumps and two leak detectors.

27. The 5th October Electronics and Automation Complex developed the CFC-12-based refrigeration compressor manufacturing technology in 1991. The production facilities include foundry, machining, assembly and testing lines.

28. As a result of conversion, the production of refrigerators will be converted from CFC-11 to cyclopentane based technology in foaming operations by providing the necessary new production and safety equipment suitable for operations with the flammable blowing agent. The refrigerant part will be converted using HFC-134a-based charging boards, leak detectors and retrofitting existing vacuum pumps. The manufacture of compressors will be switched to HFC-134a technology providing funds for redesigning the compressors as well as technology transfer, and through modification of machining, assembly and testing equipment.

29. Incremental operating costs (IOC) in manufacturing the refrigerators are calculated on the basis of the 2002 production level and requested for six months. No IOC are requested for the conversion of compressor manufacturing.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

30. The Secretariat reviewed the proposal for conversion of refrigerator and compressor manufacturing facilities in conjunction with the refrigeration management plan addressing the refrigeration servicing sub-sector which is also submitted for consideration at the 40th Meeting. In accordance with Decisions 36/17 and 39/16, the Secretariat proposed that UNIDO and UNEP combine the phase out activities in the two sub-sectors into one national CFC phase out plan and to assign a lead implementing agency. This would facilitate co-ordination of training and conversion activities in terms of timing and content of the curriculum of training courses, monitoring and reporting of CFC phase-out especially in relation to the non-investment component. However, the proposal from the Secretariat was not accepted.

31. The country programme update indicates that D.P.R. Korea is planning production of propane and isobutane as alternative refrigerants after closure of its CFC-12 production facilities. Additionally, a new refrigerant "Moran" was developed locally as a substitute to CFC-12 in the domestic refrigeration sector. In this regard, the Secretariat sought clarifications from UNIDO concerning the choice of HFC-134a as alternative technology to be utilized in refrigerator and compressor manufacturing and concerning the potential supplier of HFC-134a based technology and the refrigerant. UNIDO responded that HFC-134a remains the technology of choice since conversion to isobutane technology would be much more costly due to the flammability issue. "Moran" is still at the experimental stage of development and is not yet considered as a substitute. The source of HFC-134a technology and future refrigerant supplier will most probably be China, however, China currently has limited production capability of HFC-134a.

32. The incremental operating costs are calculated on the basis of the 2002 production figure. The Secretariat sought clarifications from UNIDO on the very uneven production patterns at the 5th October factory as demonstrated in Paragraph 3 above. UNIDO explained that in 1995-2000 the country experienced tremendous economic difficulties due to natural calamities. The Secretariat requested additional information which could justify the reported 2002 production level. At the time of preparation of this evaluation document no additional information was provided by UNIDO regarding the claimed production.

33. The Secretariat and UNIDO discussed the incremental capital costs. The costs of a second mixing head in the refrigerator conversion sub-project and a refrigerant charging unit in the compressor conversion sub-project were recognized as ineligible for funding. The requested costs of a buffer tank and a fire protection system were reduced as per prevailing costs in similar approved projects. UNIDO adjusted the budget and revised the project document accordingly.

34. The Sub-Committee on Project Review will be advised of the outcome of ongoing discussions with UNIDO on the issues listed above.

PROJECT EVALUATION SHEET
D.P.R. KOREA

SECTOR: Solvent ODS use in sector (2002): 1,675 ODP tonnes

Sub-sector cost-effectiveness thresholds: N/A

Project Titles:

(a) Plan for phase-out of CTC in the cleaning solvent sub-sector

Project Data	**Solvent**
	Cleaning Solvent Sub-Sector plan
Enterprise consumption (ODP tonnes)	332.0
Project impact (ODP tonnes)	332.0
Project duration (months)	24
Initial amount requested (US $)	4,713,741
Final project cost (US $):	
Incremental capital cost (a)	4,248,602*
Contingency cost (b)	411,460
Incremental operating cost (c)	53,679
Total project cost (a+b+c)	4,713,741
Local ownership (%)	100
Export component (%)	0
Amount requested (US $)	4,713,741
Cost effectiveness (US $/kg.)	14.19
Counterpart funding confirmed?	Yes
National coordinating agency	National Coordinating Committee for Environment (NCCE)
Implementing agency	UNIDO

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

* Includes US $134,000 included as policy and management support cost.

PROJECT DESCRIPTION

Plan for phase-out of CTC in the cleaning solvent sub-sector in D.P.R. Korea

35. UNIDO has submitted for consideration of the 40th Meeting a sub-sector plan to phase out CTC as cleaning solvent in the four remaining factories using CTC as cleaning solvent in metal cleaning and cleaning of integrated circuits. UNIDO plans to submit an overall solvent sector phase-out plan to the 41st Meeting. The objectives of the project were stated as follows;

(a) To achieve complete phase-out of carbon tetrachloride (CTC) in the cleaning solvent sub-sector in D.P.R. Korea within two years;

(b) To enable D.P.R. Korea to meet its obligations of CTC reduction and elimination in accordance with the control schedule of the Montreal Protocol;

(c) To ensure timely, sustainable and cost-effective CTC phase-out in the cleaning solvent sub-sector through appropriate investment, technical support and management support.

36. The following are the four projects in the plan and their costs:

	CTC consumption ODP tonnes	Total Project Cost US $	Cost-effectiveness US $/kg
Integrated Circuit Factory (ICF)	22.0	236,617	10.76
Moranbong Automation Instrument Co. (MAI)	54.2	560,613	10.34
Saenal Electricity Factory (SEF)	37.4	439,828	11.76
"Sungri 58" Truck Complex (STC)	216.7	3,342,693	15.43
Sub-total	330.3	4,577,751	
Management support cost		134,000	
Total	**330.3**	**4,711,751**	**14.26**

CTC production and consumption in D.P.R. Korea

37. D.P.R. Korea reported 2000 data for production and consumption of CTC as 1,045 ODP tonnes each. However, a recent analysis of this data has shown that 102.3 ODP tonnes of the 2000 production which was used as feedstock has been reported as consumption to the Ozone Secretariat. In that year, D.P.R. Korea also reported production of 77 ODP tonnes of CFC-12 equivalent to 102 ODP tonnes of CTC. Thus, the consumption of CTC in 2000 corrected in accordance with the provisions of the Montreal Protocol would be 942.7 ODP tonnes. Based on the corrected figure the CTC baseline consumption for D.P.R. Korea should be 1,251.07 tonnes instead of 1,285.17 calculated for it by the Ozone Secretariat on the basis of D.P.R. Korea's data reports for 1998-2000.

38. At the 38th Meeting in November 2002, the remaining CTC consumption in D.P.R. Korea was determined to be 638 ODP tonnes based on the 2000 consumption of 1,045 ODP tonnes. The actual remaining CTC consumption eligible for funding as at the 38th Meeting (less the undeclared feedstock amount) was therefore 535.7 ODP tonnes. Therefore, following approval

of three projects at the 38th Meeting to phase out 158.8 ODP tonnes of CTC, the remaining amount of CTC eligible for funding should be 376.9 ODP tonnes. The four projects being submitted by UNIDO to the 40th Meeting would phase out 330 ODP tonnes based on 2000 consumption. Thus, the remaining consumption to be funded after the 40th Meeting based on information provided to the Executive Committee by UNIDO in the previously approved projects would be 123.1 ODP tonnes.

39. CTC is produced in D.P.R. Korea by only one state-owned enterprise (2.8 Vinalon Complex) which also produces other ODS. There are no imports of CTC. The CTC production capacity as well as the levels of production and downstream uses for the period 1995 to 2000 were verified through an audit conducted in 2001 and documented in a report submitted to the Executive Committee at the 35th and 36th Meetings for purposes of determining the compensation for closure of ODS production in D.P.R. Korea (Wakim Consulting, Technoeconomic Audit: Production of Ozone Depleting Substances (ODS) in the Democratic People's Republic of Korea). The CTC production capacity of 2.8 Vinalon Complex was reported to be 2,300 tonnes/year (2,530 ODP tonnes/year) with 56-63% capacity utilization in 1995-1999 and 41% in 2000. The verified total CFC production figures were consistent with data which had already been reported by D.P.R. Korea to the Ozone Secretariat for that period.

40. In the phase-out plan submitted by UNIDO to the 40th Meeting the CTC production and consumption being claimed for 2000 and preceding years exceeds the verified amounts by 60% to about 100%. As an example, in 2000, D.P.R. Korea's total production of CTC as reported to the Ozone Secretariat and confirmed by the audit and also by UNIDO in previous projects was 1,045 ODP tonnes i.e. 41% of 2.8 Vinalon's production capacity as confirmed by the production audit. The Government has confirmed that there was a drastic cut in CTC production in 2000. UNIDO, however, states in its 40th Meeting documents that the CTC production in 2000 was 1,853.7 ODP tonnes which is 73% of 2.8 Vinalon's production capacity, far in excess of the company's verified CTC output for the year. The total production of CTC in 2001 and 2002 are reported by UNIDO to be 2,250 ODP tonnes (including 397 ODP tonnes for feedstock) and 2,245 ODP tonnes (including 442 ODP tonnes for feedstock). These outputs constitute 98% of 2.8 Vinalon's production capacity which, it appears, has never exceeded 65 per cent.

41. UNIDO indicated that the excess consumption is due to uses of CTC as fumigants, process solvents and formulation solvents which have only recently been identified by UNIDO itself and in surveys by UNEP as part of D.P.R. Korea's country programme update. UNIDO also maintains that these amounts had previously been considered by D.P.R. Korea as amounts for feedstock uses. However, the data reports of D.P.R. Korea to the Ozone Secretariat or the Fund Secretariat do not support this claim as the amounts of CTC reported by the country for feedstock uses are much lower than the amounts verified through the audit or the amounts claimed by UNIDO to be consumption.

42. The table below provides a comparison between quantities of CTC reported by D.P.R. Korea for production, feedstock and consumption (or demand), those reported by the audit and the new data reported by UNIDO in the project document based on D.P.R. Korea's country programme update.

Comparisons between Reported, Audited and CPU Data on CTC Production, Consumption and Feedstock

Year	Total CTC Production ODP Tonnes			CTC used as Feedstock ODP Tonnes			CTC Demand (Consumption) ODP Tonnes			% Increase of CPU Consumption over Reported Consumption
	Officially Reported Data	Audit Data	CPU Data	Officially Reported Data	Audit Data	CPU Data	Officially Reported Data	Audit Data	CPU Data	
2000	1,045	1,045	1,855.7	0 (102.3)	102.3	102.3	1,045 (942.7)	942.7	1,753.4	68 (85)
1999	1,529	1,529	2,326.5	143	506	143	1,386	1,023	2,183.5	57
1998	1,562	1,562	2,563.9	137.5	429	137.5	1,424.5	1,133	2,426.4	71
1997	1,606	1,606	2,379.3	297	561	297	1,045	1,309	2,082.3	99
1996	1,595	1,595	2,367.2	263	583	363	1,232	1,012	2,004.2	98

- Officially reported data: Data report by D.P.R. Korea to the Ozone Secretariat.
- Audit data: Data reported in the production audit report.
- CPU data: Data taken from the country programme update by UNIDO and used in the solvent projects.
- Data in brackets are corrected data for 2000.

43. The audit report also identified that 2.8 Vinalon sold CTC "below production costs confirming the information that the driver for production was that of meeting quotas established by the government, rather than realizing profit from sale". The socio-economic climate at the time and information provided by UNIDO in previous documents to the Executive Committee give strong reason to believe that the production figures officially reported by the government for the period 1995-2000 represent the production quotas established by the government during that period. It may be noted that in an economy such as that of D.P.R. Korea with a sole producer of a specific product and no imports, the supply side strictly determines the demand (consumption). Therefore, a survey of the demand side as is reported to have been conducted by UNEP would not be an appropriate or accurate method of establishing the levels of consumption or production. Without any clear evidence to the contrary, it may be assumed that the production figures provided in the country programme update were only projections made from the consumption data said to have been collected from the survey of consuming industries.

44. The 2001 and 2002 production and consumption data which were not covered by the audit in 2001 show about 100 per cent increase over audited 2000 figures. There is no means by which these figures could be verified or substantiated. The Government of D.P.R. Korea stated that the country experienced "consecutive natural disasters and economic difficulties" which caused considerable collapse of production against capacity and that the economy began to recover in 2000. It also stated that industries, including the large truck complex "Sungri 58" were hard hit by severe electricity shortages which not only hampered production but also cut production of CTC driving the "Sungri 58" Truck Complex to use solvents such as diesel or petrol and sometimes even detergent for cleaning. UNIDO also informed the Executive Committee in its projects to the 36th, 37th and 38th Meetings in 2002 that CTC production was diverted to metal cleaning industry from 1996 onwards. Therefore, the claim by UNIDO that, as

much as excess of 1,000 ODP tonnes of CTC over the verified and reported amount were produced in 1998 principally for process agent and formulation solvent uses does not appear to reflect the reality of the situation.

45. On the basis of the above information the CTC production and consumption data presented by UNIDO in the project documents appear to lack credibility and the extra amounts of CTC reported to have been identified as "missing" consumption for process agents appear not to be eligible for funding.

46. Beside the issue of credibility of the CTC production and consumption data presented in the project documents, the new data pose a significant problem of establishing credible production and consumption baseline levels for D.P.R. Korea. The new data which have been revised for the entire period 1995 to 2000 result in production and consumption baseline values which are significantly higher than the baseline officially established for D.P.R. Korea by the Ozone Secretariat based on its officially reported data. The following table shows the officially established baseline for D.P.R. Korea, the corrected baseline and the new baseline taking account of reported feedstock amounts for 2000 based on the new data from the country programme update and presented in the project document at the 40th Meeting.

Baseline	Production ODP tonnes	Consumption ODP tonnes
Officially established baseline pursuant to Article 7	1,285.2	1,285.2
Officially established baseline less unreported feedstock data	1,251.1	1,251.1
Baseline based on CPU/project document data	2,121.1	2,121.1

47. Against this background of apparent lack of credibility in the CTC production and consumption data presented in the project documents, it appears that the only valid basis for determining the remaining CTC consumption is the use of the verified 2000 production and consumption data used by UNIDO in the previously approved projects, albeit with an error in the baseline and 2000 consumption values. The CTC phase-out profile based on the corrected 2000 consumption data is as follows:

- CTC baseline consumption (corrected for feedstock) 1,251.1 ODP tonnes
- Total amount of CTC funded but not yet implemented as at the 40th Meeting 555.8 ODP tonnes
- 2000 CTC consumption 942.7 ODP tonnes
- CTC consumption remaining unfunded (based on 2000 consumption data) 386.9 ODP tonnes
- Quantity of CTC required to be phased out to meet 85% reduction (1,251.1 X 0.85 – 555.8) 507.64 ODP tonnes

48. It is pertinent to note that the new 1995-2000 data that have been presented in the project document and used partly or fully as basis for calculating eligible level of funding of the four

projects have not been officially reported to the Ozone Secretariat in accordance with relevant provisions of the Montreal protocol and decisions of the Parties to the Protocol.

Individual projects

49. The individual projects are described below:

(a) Conversion of cleaning processes from CTC to perchloroethylene cleaning at the plating workshop of the Saenal Electricity Factory (SEF)

50. SEF was established in 1968. The enterprise's major products are enamel-coated copper wire, domestic fans, high speed household crushers, motors for washing machines, electric generators and electric drills. In 2002, the enterprise consumed 37.4 ODP tonnes CTC in its cleaning operations. The enterprise operates 35 year old open top machines (3) and machines with lid and rotation (3) imported from the former U.S.S.R.

51. The consumption of CTC will be phased out by converting to the use of perchlorethylene (PCE). The six machines will be replaced by closed hot liquor and/or vapour cleaning machines of various sizes equipped with internal solvent recovery units and ancillary equipment (air compressor, water chiller and voltage regulator) at a cost of US $311,710. The costs for inland transportation, installation, trials, training, testing and safety equipment amount to US $41,600. A solvent recovery unit at the cost of US $16,500 is also requested. Incremental operating cost amounts to US $33,027. The cost of the project is as follows:

Incremental capital cost	US $369,810
Contingency	US $36,981
Incremental operating cost	US $33,027
Total project cost	US $439,828
Cost-effectiveness	US $11.76/kg

(b) Conversion of cleaning processes from CTC to perchloroethylene cleaning at the plating workshop of the Moranbong Automation Instrument Co. (MAI)

52. MAI which was established in 1978, produces items for automation and measuring instruments with electrical meters, thermostats, bimetallic thermometers and electrical resistors as major products. The enterprise used average (2000-2002) of 54.2 ODP tonnes of CTC in its cleaning operations in three workshops using eight cleaning machines from former D.D.R. (former East Germany) said to have been installed in 1977.

53. The consumption of CTC will be phased out through conversion to the use of perchloroethylene. The eight machines will be replaced with four closed cleaners of various sizes each with internal solvent recycle unit, air compressor, water chiller and voltage regulator. The four machines cost US $408,220 including US $22,700 per machine for ancillary equipment. Costs for inland transportation, installation, trials, training, testing and safety equipment amounting to US $65,700 are also requested as well as US $33,000 for a solvent recovery unit. Incremental operating cost amounts to US $25,023. The cost of the project is as follows:

Incremental capital cost	US $510,460
Contingency	US $51,046
Incremental operating cost	US $25,023
Total project cost	US $586,529
Amount requested	**US $560,613**
Cost-effectiveness	US $10.67/kg
Required counterpart funding	**US $25,916**

(c) Conversion of cleaning processes from CTC to aqueous alkaline and solvent cleaning at "Sungri 58" Truck Complex (STC)

54. STC which was established in 1950 produces mainly heavy duty trucks from 2.5 tonne-40 tonne trucks. In 2002, the enterprise consumed 216.7ODP tonnes of CTC in its cleaning operations. The cleaning operations are carried out in 16 workshops some of which are scattered around the city (Tokchon City). Some of the workshops have a number of sub-workshops or cleaning lines, e.g. the engine block workshop has 20 cleaning lines. In all, the enterprise uses 74 open baths, 23 continuous degreasers, 14 open trays and 2 open tanks. The open baths were originally imported from the former U.S.S.R. or former D.D.R., some of which were refurbished into continuous degreasers by the enterprise itself.

55. The consumption of CTC will be phased out by converting the aqueous alkaline and perchloroethylene solvent processes and hand wiping. This involves the replacement of the existing equipment with 20 aqueous alkaline 4-stage spray chambers of various sizes with a cost ranging from US $68,000-165,000 each, and eight closed PCE cleaners also of various sizes costing from US $64,000-US $140,000 each. Each machine is fitted with ancillary equipment (voltage regulators, air compressors, water chillers, etc) at a cost ranging from US $17,600 to US $37,600 for a total cost of US $633,400, including US $156,800 for voltage stabilizers. A solvent recovery unit costing US $33,000 and chemical effluent treatment system costing US $77,000 are also to be installed. The capital costs also include inland transportation and installation costs of US $105,000 and safety costs of US $54,700. There are incremental operating savings of US $21,888. The cost of the project is as follows:

Incremental capital cost	US $4,233,660
Contingency	US $423,366
Incremental operating savings	(US $21,888)
Total project cost	US $4,635,138
Amount requested	**US $3,342,693**
Cost-effectiveness	US $15.43/kg
Required counterpart funding	**US $1,292,445**

In view of the level of counterpart funding required to be paid by "Sungri 58" UNIDO has been requested to provide indication that the enterprise has made commitment to provide counterpart funding at this level of funding.

(d) Conversion of cleaning processes from CTC to perchloroethylene cleaning at the Integrated Circuit Factory (ICF), , Pyongchon District, Pyongyang

56. ICF which was established in 1987 produces integrated circuits of various kinds. Only the wafer workshop, where silicon crystals are grown and cut and the diode workshop where bipolar diodes are produced have CTC cleaning operation. Sixty million pieces of integrated circuits of all kinds were produced in 2000 and 65 million pieces were produced in 2002. The wafer workshop produced and cleaned 1,300,000 large and small wafers in 2000 while 1,350,000 were produced and cleaned in 2002. The enterprise consumed 20.9 ODP tonnes of CTC cleaning operations in 2002 using 8 cleaning machines from D.D.R. installed between 1983 and 1987.

57. The CTC cleaning will be converted to cleaning with perchloroethylene (PCE) using two closed hot liquor and/or vapour cleaners equipped with internal solvent recycle unit, voltage stabilizer and water chiller at US $100,870 and US $98,857 including the cost of ancillary equipment of US $20,700 each. The cost of the project is as follows:

Incremental capital cost	US $239,127
Contingency	US $23,912
Incremental operating cost	US $17,517
Total project cost	US $280,556
Amount requested	**US $236,617**
Cost-effectiveness	US $10.67/kg
Required counterpart funding	**US $43,939**

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

CTC consumption

58. In a letter dated 11 June 2003 to the Ozone Secretariat and the Fund Secretariat among others D.P.R. Korea stated that, "as the result of the country programme update exercise with assistance of UNEP" it was transmitting its data for 2001 and 2002. This report gives CTC consumption for 2002 as 2,027.3 ODP tonnes which has been used by UNIDO as a basis for preparing the CTC phase-out projects. This consumption includes 774.4 ODP tonnes for process agent applications which are not currently recognized controlled uses, 335.5 ODP tonnes for fumigant uses and 332.2 ODP tonnes for remaining solvent cleaning applications. The remaining unfunded CTC consumption based on the reported amount of 2,027.3 ODP tonnes and consumption in ongoing projects of 555.8 ODP tonnes would be 1,471.2 ODP tonnes. Analysis of this data shows that the currently uncontrolled use of CTC as process agent constitutes about 53% while the cleaning solvent and fumigant uses constitute about 23% each. Thus, the uncontrolled process agent and fumigant uses constitute nearly 80% of the remaining CTC consumption based on the recently reported data from the country programme update. Hence the

resolution of the data issues relating to these two applications is much more critical to D.P.R. Korea meeting its CTC phase-out obligations than the approval of projects whose implementation could potentially be substantially delayed.

59. The Secretariat drew UNIDO's attention to the fact that the CTC data presented in the project document departed significantly from the data presented in recently approved UNIDO projects for D.P.R. Korea, stressing that the lack of congruence between the new and old data posed considerable difficulty to the review of the D.P.R. Korea solvent projects. UNIDO observed that their data are taken from the 2003 country programme update and that they were more reliable because they include "the previously missing process agent quantities". Given the difficulties posed by the current CTC consumption data as well as CTC baseline data there was inadequate basis upon which to assess the eligible level of consumption as well as funding of these and future projects.

60. Based on the information provided on the CTC consumption in D.P.R. Korea (in paragraphs 3-14 above) it would appear that there were no missing process agent quantities and that beside the fact that the application is currently not controlled under the Montreal Protocol they may not be eligible for funding in their own right.

Technical issues

61. The Secretariat concluded following its review that although the four projects had been presented as a sector plan with a request for policy and management cost of US $134,000, the document did not meet the criteria of a sector plan and therefore the projects would be considered on their merits as individual projects. Hence the amount of US $134,000 would not be an eligible incremental cost.

62. The Secretariat identified a number of issues relating to:

- Selection of technology and cleaning equipment.
- Essentiality/eligibility of certain ancillary equipment and facilities.
- Cost of equipment, materials and energy.

These issues are still under discussion between the Secretariat and UNIDO.

63. With regard to the selection of technology UNIDO had stated, without any documentary evidence, that D.P.R. Korea has established occupational exposure limit (OEL) of 5 ppm (parts per million) for TCE, which is the most stringent in the world, although there is no evidence that equivalent exposure limit for CTC (a more toxic chemical than TCE) currently exists and/or is enforced. Thus UNIDO and the Government of D.P.R. Korea using the OEL limits as the basis have insisted on the use of PCE technology thus driving up the costs of the projects. The Secretariat is advised that more cost-effective and equally occupationally safe technologies using TCE exist that could make the projects more viable and even obviate the need for counterpart funding, a very significant factor determining speed of project implementation. In the case of "Sungri 58" Truck Complex, as presently calculated by UNIDO, the company would need to contribute nearly 30% (US $1.3 million) of the cost of the project estimated to be US $4.6 million for its implementation. When all the potential technical upgrades are

considered, the counterpart funding could exceed 40% or close to US $2 million. In the opinion of the Secretariat and the experts consulted, this will be an unnecessary burden on the Government and the recipient enterprise and could be counterproductive as such high level of counterpart funding would potentially delay the implementation and completion of the project and defeat the purpose for which it would be funded, i.e. to enable D.P.R. Korea to complete the project in time to meet its obligation of 85% reduction in consumption.

64. The other issues of eligibility and cost of equipment and materials are mainly associated with the issue of selection of technology.

RECOMMENDATIONS

65. Although one of UNIDO's objectives for presenting the projects for consideration at the 40th Meeting was to enable D.P.R. Korea "to meet its obligations of CTC reduction in accordance with the control schedule of the Montreal Protocol", it is evident that such objective would not be achieved without first resolving the issues relating to the CTC consumption data discussed above. Therefore, the Executive Committee may wish to request UNIDO:

(a) To assist the Government of D.P.R. Korea to reexamine the CTC consumption data and take the necessary steps to establish a more reliable official level of consumption as well as the baseline to enable funding of the remaining eligible CTC consumption and at the same time enable D.P.R. Korea's obligation to the Montreal Protocol to be assessed with certainty;

(b) To submit to the 41st Meeting a CTC phase-out plan based on officially recognized CTC consumption and baseline data to address the remaining CTC consumption in D.P.R. Korea.
