

Report No. 13484-CZ

**Czech Republic**  
**Technical Support and Investment Project for the**  
**Phaseout of Ozone Depleting Substances**

**Project Document**  
**August 1994**

**CZECH REPUBLIC**  
**TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE**  
**PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**CURRENCY EQUIVALENT**  
Czech Koruna 28.50 = US\$1.00

**WEIGHTS AND MEASURES**  
The metric system is used throughout this report.

**GLOSSARY OF ABBREVIATIONS**

BHL	=	Bratři Horákové, s.r.o. (Ltd.)
CEE	=	Central and Eastern Europe
CFC	=	Chlorofluorocarbon
CKD-C	=	CKD Compressors
CK	=	Czech Koruna
CR	=	Czech Republic
CSFR	=	Czech and Slovak Federal Republic
CTC	=	Carbon tetrachloride, a regulated substance
DOU	=	Document of Understanding
GEF	=	Global Environment Facility
GET	=	Global Environment Trust
FI	=	Financial Intermediary
FSU	=	Former Soviet Union
HCFC	=	Hydrochlorofluorocarbon
HFC	=	Hydrofluorocarbon
ICB	=	International Competitive Bidding
IPB	=	Investiční a Postovní Banka
IS	=	International Shopping Procedures
LCB	=	Local Competitive Bidding
LS	=	Local Shopping Procedures
MFMP	=	Multilateral Fund for the Implementation of the Montreal Protocol
MOE	=	Czech Ministry of Environment
MP	=	Montreal Protocol on Substances that Deplete the Ozone Layer
MW	=	Megawatt
NBF	=	Not Bank-Financed
ODP	=	Ozone depleting potential
ODS	=	Ozone Depleting Substances
PAA	=	Project Administration Agreement
PCE	=	Perchloroethylene
PIM	=	Project Implementation Manual
PMU	=	Project Management Unit
PU	=	Polyurethane
SOE	=	Statement of Expenditures
STAP	=	Scientific and Technical Advisory Panel
TAG	=	Technical Advisory Group
UNEP	=	United Nations Environment Program
3R	=	Recovery, Reclamation and Recycling

**FISCAL YEAR (FY)**  
January 1 to December 31

**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

GRANT AND PROJECT SUMMARY

Grantee: Global Environment Trust

Country: Czech Republic

Project Name: Technical Support and Investment Project for the Phaseout of Ozone Depleting Substances

Grant Amount: US\$2.3 million

Terms: Grant

Onlending: Not applicable

Beneficiary: Czech Ministry of Environment and sub-project beneficiaries through a financial intermediary

Associated Bank Project: None. Stand-alone project

Financing Plan:

	Local	Foreign	Total
Source	(US\$ Million)		
GET Grant	1.466	0.844	2.3
<b>TOTAL</b>			<b>2.3</b>

Economic Rate of Return: Not calculated, though substantial economic and environmental benefits

Bank Technical Advisor: Ken King (ENVGE)

Outside Technical Reviewers: Mr. Robert Watson (STAP) and Mr. Art Fitzgerald (Northern Telecom and Ozone Operations Resource Group).

## CZECH REPUBLIC

### TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE PHASEOUT OF OZONE DEPLETING SUBSTANCES PROJECT

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#### BACKGROUND

1. The Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) (MP) are international environmental agreements which call for the phaseout of substances that deplete the stratospheric ozone layer (hereafter "regulated substances"). More than 100 countries representing over 95 percent of world consumption of these regulated substances have ratified the Montreal Protocol and Vienna Convention. The Montreal Protocol with its amendments and adjustments now mandates the complete phaseout of production and consumption of a number of ozone depleting substances (ODS) in developed countries by January 1, 1996. All industrialized countries in the world have undertaken comprehensive national programs to develop cost-effective strategies to phase out the use of these substances in the various end-user sectors. The largest family of ODS is chlorofluorocarbons (CFCs) and which are widely used in various industrial applications including: domestic, commercial and industrial refrigeration and air conditioning, flexible and rigid insulation foam, and in numerous applications such as aerosol propellants, and solvents, among others.
2. The Czech Republic (CR), presently the largest producer and an important consumer of the regulated substances in Central and Eastern Europe (CEE), has been actively planning its ODS phaseout strategy since 1991. A comprehensive Country Program for the Phaseout of Ozone Depleting Substances in the former Czech and Slovak Federal Republic (CSFR) was undertaken, with Bank support, in April 1992 and completed in November 1992 as part of an important regional study on environmental issues in Central and Eastern Europe (CEE). This study served as the basis for establishing the priorities for the Czech Government and for identifying key policy and regulatory measures which would be required to support a cost effective phaseout, which would also minimize disruptions to the industrial sectors which utilize ODS. The activities proposed for funding under this Project are among those priority activities identified in the Country Program.
3. In 1991, the former CSFR's consumption of regulated ODS was 3935 metric tons (t) (equivalent to 3759 ozone depleting potential [ODP] weighted tons), which amounts to a per-capita consumption of 0.22 kg. The Czech Republic accounted for 60 percent of the total consumption in the former CSFR. The distribution of ODS consumption in the former CSFR was aerosols -- 1600 metric tons (40.7%); refrigeration -- 1057 metric tons (26.9%); solvents -- 989 metric tons (25.1%); and foams -- 289 metric tons (7.3%).
4. Since 1991, the ODS consumption profile has changed due to the effects of market forces, industrial restructuring, the regulatory environment, and general technological trends. Usage in the aerosol and flexible foam sectors has been eliminated through the adoption of regulatory measures supported by local market forces. Although precise 1993 data is unavailable, ODS consumption in that year is estimated at about 1,430 tons, concentrated mainly in refrigeration (48.0% including a large usage in servicing of used equipment), solvents (41.5%), and rigid foam production (10.5%). Thus the Project will provide for the funding of key investment activities supporting ODS phaseout in refrigeration and rigid foams, since the use of solvents is dispersed among a wide number of different applications with no single large user as in the other sectors. In addition, existing regulations governing the phaseout of CFCs in solvents will require an earlier phaseout than is feasible to be covered under the project.

5. Spolek Chemical Works accounts for 100% of CFC production in the Czech Republic. Until recently, production was approximately equal to Spolek's production capacity for CFCs which is about 2000 tons per year (t/y), mainly CFC-12 and smaller amounts of CFC-11, and CFC-113. Also, a substantial amount of carbon tetrachloride (CTC) (also a regulated substance) is generated as a by-product of epichlorohydrine production at the country's only CFC production facility. A portion of the CTC is used as one of two raw materials in the production of CFC.

6. The Czech Republic is fully committed to the complete phaseout of the production and consumption of regulated substances by 1996 as mandated by the Montreal Protocol and its amendments. The former CSFR was a signatory of the Montreal Protocol and Vienna Convention and the Czech Republic has succeeded to the former CSFR's ratification of the Montreal Protocol. Although the Czech Republic was designated a developed country under the Montreal Protocol, and is therefore not eligible for financial assistance from the Multilateral Fund for the Implementation of the Montreal Protocol (MFMP), the funding mechanism of the Montreal Protocol, it is nevertheless eligible for Global Environment Facility (GEF) funding under the Reduction of Ozone Layer Depletion component.

#### **RATIONALE FOR GEF INVOLVEMENT AND PROJECT ELIGIBILITY**

7. With the exception of Romania and the former Yugoslavia, countries from CEE and the former Soviet Union (FSU) are not eligible for assistance from the MFMP. Nevertheless, the total production and consumption of ODS in CEE and FSU is equal to that of all the developing countries (including China, India, Brazil and Thailand) which are eligible for MFMP assistance, and therefore represent an opportunity to achieve significant global environment benefits through the adoption of cost effective technological interventions.

8. This Project has been developed and structured based on specific ODS phaseout requirements in the Czech Republic (as outlined in the Country Program) and the general project eligibility criteria guidelines of the GEF Scientific and Technical Advisory Panel (STAP). Funding for this stratospheric ozone layer protection project has been obtained from the GEF on the basis that the Czech Republic:

- (a) is eligible for GEF assistance;
- (b) is not classified as a developing country and is not eligible for funding from the Multilateral Fund for the Implementation of the Montreal Protocol;
- (c) has completed the preparation of a Country Program; and
- (d) has undertaken to succeed to the former CSFR's ratification of the Vienna Convention and Montreal Protocol.

9. The Project, which consists of five sub-projects, is consistent with international efforts in the field of ODS phaseout. The sub-projects are deemed to be effective and are essential interventions in order to quickly and successfully phase out the use of the regulated substances. This project will be the first comprehensive and planned ODS phaseout program to be implemented in Eastern Europe.

#### **GEF PROJECT OBJECTIVES**

10. The principal objective of the Project is to assist the Czech Republic in the phaseout of ODS production and consumption in a cost effective manner by the year 1996, as mandated by the Montreal

Protocol and its amendments and adjustments. Specifically this Project will assist the Czech Republic to:

- (a) initiate the phaseout of the production of CFCs;
- (b) phase-in the operation of a national network for refrigerant recovery/reclamation/recycling (CFC-11 and CFC-12); and
- (c) support applied engineering efforts to use ODS substitutes in manufactured goods (mainly refrigeration and commercial/industrial cooling applications), thereby reducing both the immediate and future needs for regulated substances.

GEF support will provide an incentive for the early adoption of ODS phaseout activities and capture additional environmental and economic benefits which would otherwise either be lost or delayed.

### **PROJECT ELIGIBILITY AND DETERMINATION OF SUB-PROJECT INCREMENTAL COSTS**

11. This Project is the first and only ozone-related project to be funded during the pilot phase of the GEF and there are therefore no precedents on matters of eligibility of the various sub-projects. On this basis, it was decided to adopt the specific eligibility criteria developed for projects to be funded by the MFMP. The GEF Participants, which approved the funding of this Project, are also Parties to the Montreal Protocol and most of them are contributors to the MFMP. The application of the project eligibility criteria assured a fair and consistent assessment of the nature of activities which could be funded and of the level of funding (defined as incremental costs) which could be allocated. Incremental costs, as defined by the Parties to the Montreal Protocol, are the costs incurred by the participating enterprise which would otherwise not have incurred in the absence of the Montreal Protocol. The sub-projects proposed in this Project meet the project eligibility criteria established by the Parties to the Montreal Protocol.

12. The sub-projects were selected by the Czech Ministry of Environment from the list of potential sub-projects which had been identified during the preparation of the Country Program. The sub-projects were selected on the basis of their impact on ODS consumption, their potential for minimizing the impact of ODS phaseout on the economy and their replicability in the Czech Republic and Central and Eastern Europe. The participating enterprises were selected on the basis of their capacity to undertake the sub-projects (such as for Ekotez and Kovosluzba), their technological leadership positions (such as for Thermo-King-Frigera and Bratři Horákové, s.r.o. (Ltd.)(BHL)) or their special situation within the context of ODS production (such as Spolek, the only ODS producer in the Czech Republic) within the country. The financial situation of the enterprises was verified during the course of project preparation, and all participating enterprises anticipate improved cash flows and profitability over the life of the project.

13. The level of funding for each sub-project was determined on the basis of the incremental costs at the sub-project level. Incremental cost may or may not be equal to the project cost, as this will depend on whether savings will accrue to the participating enterprises and which must be considered in the determination of the final incremental cost. Other factors which must be considered in determining the sub-project incremental cost include, but are not limited to level of technology upgrade achieved by the project, impact on production capacity and cost of substitute materials. For all the sub-projects proposed as part of this Project, counterpart contributions have been made by the Participating Enterprises in terms of time for the preparation of the project documents and, in most cases, in the

implementation of the sub-project, either through management time or through direct investment. This will be reflected in the sub-grant agreement.

14. Additional counterpart contributions are expected during the implementation phase of the Project, and these are estimated at \$300,000 and \$1.55 million for Sub-projects 2 and 4, respectively. The proposed level of funding represents a conservative but fair estimate of the incremental costs which will be incurred by the Participating Enterprises. The assessment of incremental cost for the national recycling scheme (Sub-project 2) is slightly different as it establishes a new business venture, which does not presently exist. In this specific case, the incremental cost was determined on the basis of the analysis of cash flows of all participants and GEF funding determined on the basis of ensuring an adequate return on the investment for all those participating.

15. It is therefore proposed that the Project cost of US\$2.3 million be funded by the GEF under its Reduction of Ozone Layer Depletion component. Funds would be provided as a grant from the GEF to the Czech Republic and channelled to the Participating Enterprises through a local financial agent. The estimated costs are to be considered incremental costs net of any potential savings. Overall Project cost has been reduced by using a reclamation process which makes use of the existing CFC production equipment at Spolek Chemical Works. Proceeds of the grant will not be utilized for transfer payments, such as taxes and duties.

## PROJECT DESCRIPTION AND COSTS

16. The Project consists of five sub-projects. Comprehensive sub-project descriptions are provided in the Technical Annex. The sub-projects will consist of the following activities:

(a) Under sub-project 1 (Engineering Assistance for ODS Production Phaseout), the Czech Republic will develop a strategy to shutdown CFC production by January 1, 1996 while minimizing the environmental impact of excess amounts of carbon tetrachloride (CTC) produced at Spolek Chemical Works. Spolek produces up to 2000 t/y of CFC-12, with smaller amounts of CFC-11 and CFC-113 as by-products by using CTC (also a regulated substance) as a raw material. The shutdown of the CFC production operation will create an imbalance in the production facility's plant material balance. Presently, the only alternative available to the enterprise is to incinerate the excess CTC. This sub-project will fund a study that will evaluate available methods of converting CTC to other marketable materials, identify available methods of developing a raw material for producing HFC-134a, and make recommendations on whether CTC can be used as raw materials in the production of other hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs). Funding for this sub-project amounts to US\$80,000 to cover the cost of an engineering study.

(b) Sub-project 2 (Design and Operation of CFC Refrigerant Reclamation Facilities and Establishment of Refrigerant Recovery Capacity in the National Network of Servicing Companies) will establish a national refrigeration recovery/reclamation/recycling (3R) program in the Czech Republic. It will be developed in two phases, with the first phase focusing on the development of a comprehensive plan and program for recovery, the establishment of the first reclamation facility at the Spolek Chemical Works and the establishment of the training center with the participation of Union of Workers and Organizations in Refrigeration and Air Conditioning. The second phase consists of setting up the nationwide recovery network, with the participation of Ekotez and Kovosluzba. Funding for this sub-project amounts to US\$1.04 million to cover the cost of reclamation

equipment, to provide an incentive for the cost of recovery equipment and to provide training to the service technicians.

Phase 1 of this sub-project will consist of the following:

- Establishment of the first reclamation plant (for CFC-11 and CFC-12) at Spolek Chemical Works including reclamation equipment (tank, pumps, boiling tank, etc...), laboratory equipment (gas chromatograph, scales and testers) and cylinder handling equipment for a total cost of US\$253,000;
- Establishment of the training center (recovery units, testing kits, etc...), research visits to two European recycling centers, the establishment of a training program for the refrigeration technicians and a public information campaign for a total cost of US\$138,000;

Phase 2 of this sub-project will consist of the following:

- Establishment of a collection site (for all recovered materials) and reclamation unit (mainly for HCFC-22) close to the Prague metropolitan area including testing equipment (gas chromatograph, pumps, testing equipment) at a cost of about US\$169,000;
- Purchase of 2000 empty gas cylinders (including color coding system) for use in the 3R network at a cost of US\$140,000;
- Retrofitting of 4 vehicles for establishment of extraction and collection of recovered material at a cost of US\$90,000;
- Financial incentive of about US\$400 for the purchase of 500 recovery units (average cost of unit about US\$1,000) by the servicing companies for a total of US\$200,000. The counterpart financing to be provided by the servicing companies will amount to over US\$300,000;
- Provision of a reserve of US\$50,000 to cover potential operating losses (due to start up of the 3R network) of the reclamation center at Spolek Chemical Works. The reserve was determined on the basis of a cash flow analysis and represents an amount which would cover part of the operational losses should very small amount of CFCs be recovered.

The logistics of the 3R network have been analyzed by the participating enterprises (Spolek Chemical Works, Ekotez, Kovosluzba and Union of Refrigeration Technician). The proposed flow of materials and of funds have been fully outlined in a Document of Understanding signed by all the participants.

- (c) Sub-project 3 (Introduction of Non-ODS Refrigerants in the Commercial, Industrial and Refrigerated Transport Sectors) will phase out CFCs used in commercial, industrial and transport refrigeration systems. The project involves two participants, Thermo-King-Frigera and CKD Compressors (CKD-C). Thermo-King-Frigera, a manufacturer of commercial and industrial refrigeration systems, will: convert its existing models of transport cooling systems from CFC-12 to HFC-134a; develop retrofit techniques for existing commercial cooling systems it has manufactured and prepare a retrofit manual. CKD-C will, with the technical assistance of Thermo-King-Frigera, participate in a pilot program and will retrofit a centrifugal chiller and screw compressor used as part of a

municipal heat pump installation. The project will result in the prototype production of HFC-134a transport refrigeration units, and establish retrofit techniques for existing commercial and industrial refrigeration equipment now operating on CFC-12. Funding for this sub-project amounts to US\$464,000 to cover the incremental costs of conversion which include engineering and design work, manufacture of prototypes, purchase of leak and other testing equipment, recycling machines and costs of test retrofits;

- (d) Sub-project 4 (Introduction of Non-ODS Insulation Technologies in Cold Room Panel Manufacturing) will introduce low-ODS and non-ODS foaming technologies to companies in the Czech Republic, through the demonstration of available technologies and the training of manufacturers through technical seminars. The project includes the development of demonstration technology for the production of selected products using CFC-free foam at the BHL company. The first step will replace 50 percent of the CFC-11 with water in the foam products which have not been converted. This step also includes the set-up of a small testing facility where different reduced CFC-foam formulations can be studied. The second and third steps will move from low-pressure (LP) blowing to high-pressure (HP) blowing equipment (or modification of the HP equipment). Finally, technical seminars will be organized, and documentation and consultant services will be provided for other producers. Funding for this sub-project is US\$363,000 to cover the incremental costs of equipment, laboratory construction and will also support the training component. The availability of the testing facilities for other companies to use will be ascertained through the Sub-grant Agreement which is to be signed between BHL and the Financial Intermediary. BHL has spent close to US\$2 million to upgrade its level of foam blowing technology over the last three years; and
- (e) Sub-project 5 (Set-up of a Project Management Unit (PMU)) will set up an ODS Phaseout Project Management unit (PMU) to be supported by a Technical Advisory Group (TAG). The PMU will coordinate the implementation of the Project, oversee procurement and disbursement for sub-projects 1, 2, 3, and 4 in compliance with World Bank guidelines, and in close cooperation with the Investiční a Postovní Banka (IPB), supervise project activities according to the requirements of the World Bank and MOE. As necessary, the PMU will arrange for technical assistance and consultants to assist in project implementation, and provide support to facilitate cooperation among government institutions and the producers and consumers of ODS. Finally, the PMU will be responsible for calling meetings of the TAG, which will be responsible for providing technical support to ODS consumers and producers in the implementation of investment sub-projects aimed at ODS Phaseout. Funding for this sub-project amounts to US\$300,000 to cover salaries, office equipment and the cost of hiring international consultants for supervision and review during implementation of the sub-projects.

17. The incremental cost of the five sub-projects has been determined to be US\$2.3 million, which represents only a small fraction of the national incremental costs which will be assumed by the Czech Republic economy in phasing out ODS.

## PROJECT IMPLEMENTATION ARRANGEMENTS

18. The Ministry of Environment (MOE), through the Project Management Unit (PMU), will act as general program coordinator for the Project. The MOE will liaise with other ministries on policies and industrial strategy issues. The PMU will be established by the MOE approximately two months before the Grant becomes effective. Moreover, since the PMU is a government entity, the Investiční

a Postovní Banka (IPB) will not be responsible for on-lending to the PMU under sub-project 5. Instead, disbursement for this sub-project will be made directly to the PMU.

19. The Investiční a Postovní Banka (IPB), which has worked successfully with MOE in the past, has been selected as a financial intermediary (FI) to assist the MOE with the implementation of the Project. IPB will assume the day-to-day responsibilities of Project execution including supervision of procurement, disbursement, and supervision of sub-project implementation for sub-projects 1, 2, 3, and 4. IPB has undergone basic training on World Bank procurement and disbursement procedures and will be further assisted by the Bank to successfully launch the Project. A Project Administration Agreement (subject to Bank review and clearance) will be signed by IPB and MOE. The Project Administration Agreement (PAA) confirms the responsibility of the MOE and IPB with respect to the implementation of the four sub-projects. IPB will also undertake to establish separate sub-grant agreements with each of the participating enterprises. Each sub-project proponent has prepared a Sub-project Document which will form the basis of a Sub-Grant Agreement between IPB and the participating enterprise. The Sub-grant Agreement will include reporting provisions. IPB will review the progress of the sub-projects and make recommendations on disbursements to suppliers and consultants. The standard Bank disbursement procedures will be followed, with established limits on initial deposit and replenishment levels, statements of expenditures and Bank review levels. For its services, IPB will be paid a fee of 2.72 percent on sub-projects 1, 2, 3, and 4. The fee will be paid as follows: 1 percent upon signature of Sub-grant Agreement with the participating enterprises, 1 percent pro-rata to disbursements and the final 0.72 percent upon reception by the Bank, through the PMU, of the final report upon project completion.

20. A Project Implementation Manual (PIM) has been prepared to provide the relevant Bank guidelines on procurement, disbursements, use of consultants, financial reporting, sample bidding documents and other project-specific documents. Furthermore, because the 3R scheme involves operational and logistical challenges, the Bank initiated the preparation of a Document of Understanding (DOU) outlining the responsibility of each party in the scheme, the incentive structure, and the materials and funds flow mechanisms. All parties involved in the 3R sub-project have signed this DOU.

## PROJECT BENEFITS

21. The project's major benefit will be to assist the Czech Republic to achieve its objective of completely phasing out the use of ODS as early as is technically feasible. It is expected that the project will contribute to the national objective to reduce ODS consumption by over 1000 tons per year by the end of the second year of project implementation. In addition, implementing the 3R sub-project and the refrigeration-sector sub-project will reduce ODS emissions which originate during servicing of refrigeration and air conditioning systems by as much as an additional 400 tons per year (t/y), and will extend the useful life of equipment utilizing ODS which otherwise would be discarded for lack of ODS for maintenance purposes. It is expected that the production of ODS can be successfully phased out within the same time frame, and that the phaseout of ODS production will result in a reduction of 2000 tons per year (t/y) of ODS production.

22. The Project consists of several sub-projects which will contribute to maximizing the useful life of equipment which rely on the availability of CFC for their continued use. This will contribute to reducing the country's economic cost of phasing out the use of the regulated substances.

23. Another significant benefit is the replicability of project preparation and implementation mechanisms based on the processing and implementation of this first ozone-related project to be presented under the GEF. The ultimate benefit of this project will include accelerated phaseout of ODS in many CEE countries which may initiate and implement similar policies and projects.

## **PROJECT RISKS AND MITIGATION MEASURES**

24. The risk associated with insufficient institutional capacity should be adequately offset by the establishment of the PMU and TAG to assist in the development of industry projects and programs for ODS phaseout. The work of the PMU and TAG will be essential to help industry make the transition to ODS substitutes instead of to importation of ODS following the cessation of domestic CFC production at Spolek.

25. Management structures and ownerships of several of the companies which would be assisted under this project have recently changed. The participating enterprises have survived the recent changes and are preparing for future business developments. One of the firms has established a joint-venture with a foreign company while another is discussing this possibility. Nevertheless, there will be a residual risk associated with the potential of declining financial health of some of the participating enterprises. The participating enterprises were selected on the basis of criteria described earlier. The participating enterprises have good prospects for increased profitability based on their position within their respective industrial sectors. This will be ascertained prior to negotiations by the FI through the review of financial statements (actual and projections) to ensure adequate cash flows to cover operating costs and the greater of depreciation or debt service requirements. The level of technological development made these enterprises the most suitable participants in the project.

26. The simultaneous implementation of a phaseout of ODS production and the use of the 3R program is necessary to ensure that there is a minimal shortfall of CFCs for servicing existing equipment. A shortfall could lead to increased production and/or stockpiling of new CFC-12, and/or the early retirement of equipment at significant economic cost. Experience in national 3R programs is limited to only a few countries, although many are now under development. Initially, the amounts of CFC recovered will be small, but the most important aspect of the program is to provide adequate incentive to the organizations providing servicing of existing equipment. Measures have also been proposed to closely monitor the 3R scheme. This will be monitored closely in order to react to market conditions (price and availability of CFC) which will influence the profitability (at all levels) of the 3R program. Project risk is being mitigated by placing the financial risk with Spolek Chemical Works which is capable of assuming the risk (very small in the context of the enterprise's overall activities), and by ensuring that the incentive to the servicing sector is sufficient to encourage widespread recovery of CFC through maintenance activities. To further minimize the risks to Spolek, the Project makes provisions to cover potential revenue shortfalls at Spolek for the first two years of operation of the 3R program. The potential shortfall was conservatively calculated on the basis of a very low amount of ODS recovered and of very poor quality.

27. Another initial concern was that the financial intermediary has not worked with the Bank in the past. They have recently undergone a training program designed to provide them with an introduction to Bank procedures. The Bank will provide additional training as necessary to ensure smooth project implementation, specially during the start-up phase.

## **REGULATORY FRAMEWORK**

28. Stratospheric Ozone Layer protection has been accorded high priority by the Government of the Czech Republic as an important global environmental issue. A law on the control of ODS was approved by Parliament in 1993. The legislation includes a tax of 100 Czech Korunas (approximately US\$3.5) on each kilogram of regulated substance produced or imported, and a prohibition of all imports of ODS or products containing ODS to take effect on January 1, 1994. The law adopts the ODS phaseout schedule of the Montreal Protocol and its amendments and adjustments and is fully consistent with the provisions of the Montreal Protocol on limitations on trade in the regulated substances.

## **ENVIRONMENTAL ASSESSMENT**

29. Sub-projects 1, 2, 3, and 4 will be subject to local environmental regulations and Bank project environmental review procedure. The sub-projects consist of light industrial projects which have been classified as category B on the basis of the Bank's project environmental classification system (OD 4.01) and based on previous classification of similar projects.

30. The MOE has been requested to provide its environmental clearance of all the proposed activities to be implemented by the Project by negotiations. The Project provides for resources to retain the services of international consultants for supervision of project implementation, including health and safety considerations.

## **ACTIONS TO BE AGREED**

31. The conditions of effectiveness are that the Project Administration Agreement between the Investicní a Postovní Banka and MOE be signed, and that satisfactory staff be appointed to the PMU and TAG as conditions of effectiveness of the grant.

Attachments  
Washington D.C.  
August 1994

**CZECH REPUBLIC**  
**TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE**  
**PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**SCHEDULE B**  
**PROCUREMENT AND DISBURSEMENT ARRANGEMENTS**

**A. Procurement**

1. Procurement of goods, works, and services will be in accordance with relevant Bank Guidelines. Investiční a Postovní Banka, the selected local Financial Intermediary (FI), will be responsible that procurement under the project follows Bank guidelines. It will help enterprises arrange procurement (international and local); where necessary, procurement should be handled by qualified procurement agencies authorized by the Government and acceptable to the Bank. For International Competitive Bidding (ICB) (although none is anticipated in this project at this juncture), documents would be prepared following the Bank Standard Bidding Documents, and domestic preference for goods manufactured in the Czech Republic would apply according to procurement guidelines of the Bank.

2. The local FI will satisfy itself that the goods, works, and services to be purchased are for the investment sub-projects and are reasonably priced, by ensuring that the grant recipient has followed efficient and competitive procurement practices in accordance with those of the minimum thresholds agreed (see following list):

Goods and Works

- (a) contracts over US\$300,000 equivalent would be subject to international competitive bidding (ICB) procedures;
- (b) contracts between US\$50,000 and US\$300,000 would be awarded on the basis of the Bank's international shopping procedures (IS) where price quotations would be obtained from at least three qualified suppliers from at least three countries;
- (c) contracts below US\$50,000 would be awarded on the basis of local shopping procedures (LS) where quotations would be obtained from at least three qualified suppliers; and
- (d) for civil works, contracts would be awarded on the basis of local shopping procedures.
- (e) for proprietary packages, contracts would be awarded on the basis of negotiations with the technology supplier.

Consultants

Consultants retained under the project would be recruited in accordance with the "Guidelines for the Use of Consultants by World Bank" published by the World Bank in August 1981. It is estimated that approximately 20 consultant contracts with an average cost of US\$20,000 will be processed over the life of the project<sup>1</sup>.

The Following contracts and bid packages will be subject to prior review:

- (a) ICB packages<sup>2</sup>;

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<sup>1/</sup> The type of consultancy work required for this Project consists of hiring highly specialized consultants on an as-needed basis for specific consultations and project supervision assignments. These types of assignments are best carried out through small individual contracts.

<sup>2/</sup> The provision for ICB is included in the procurement arrangements solely on a routine basis. No ICB procurement is expected in the project.

**CZECH REPUBLIC  
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**SCHEDULE A  
PROJECT COSTS AND FINANCING PLAN**

(US\$ Million)

<b>Sub-Project Title and Description</b>	<b>FINANCED BY CZECH</b>	<b>LOCAL (BY GEF)</b>	<b>FOREIGN (BY GEF)</b>	<b>PROPOSED GEF GRANT</b>	<b>TOTAL COSTS</b>
<b>Sub-project I: Engineering Assistance for ODS Production Phaseout</b>	0.000	0.000	0.080	0.080	0.080
<b>Sub-project II: Design and Operation of a CFC Refrigerant Reclamation Facilities and Establishment of Refrigerant Recovery Capacity in the National Network of Servicing Companies</b>	0.300	0.740	0.300	1.040	1.340
<b>Sub-project III: Introduction of Non-ODS Refrigerants in the Commercial, Industrial and Refrigerated Transport Sectors</b>	0.000	0.300	0.164	0.464	0.464
<b>Sub-project IV: Introduction of non-ODS Insulation Technologies in Cold Room Panel Manufacturing</b>	1.548	0.063	0.300	0.363	1.911
<b>Sub-project V: Project Management Unit</b>	0.000	0.300	0.000	0.300	0.300
<b>Financial Intermediary Fee (2.72% on Sub- projects 1-4)</b>	0.000	0.053	0.000	0.053	0.053
<b>TOTAL COSTS</b>	1.848	1.456	0.844	2.300	4.148

(b) all contracts estimated to cost US\$100,000 or more; and

(c) for selection of individual consultants, where the Bank will review the short list and terms of reference, generic letter of invitation, and award decisions.

All contracts below US\$100,000 equivalent financed through this grant will be subject to ex-post review by the Bank in order to verify compliance with Bank procurement guidelines.

**Summary of Proposed Procurement Arrangements  
(US\$ Million Equivalent)**

Project Element	Procurement Method			NBF	Total Cost
	ICB	LCB	Other <sup>(1)</sup>		
<b>1. Works</b>					
1.1 Minor building and facility services retrofits	—	—	0.050 <sup>a</sup>	—	0.050
<b>2. Goods</b>					
2.1 Equipment (including installation costs)	—	—	1.250 <sup>b</sup>	—	0.250
2.2 Incentive for purchase of recovery unit	—	—	0.200 <sup>bh</sup>	—	0.200
2.3 Materials (for testing purposes)	—	—	0.050 <sup>b</sup>	—	0.050
<b>3. Consultancies</b>					
3.1 Engineering Studies	—	—	0.080 <sup>c</sup>	—	0.080
3.2 Technical Assistance (including consultants hired by Project Management Unit and Technical Advisory Group)	—	—	0.317 <sup>c</sup>	—	0.317
<b>4. Miscellaneous</b>					
4.1 Financial Intermediary Fee	—	—	0.053 <sup>d</sup>	—	0.053
4.2 Engineering/design work undertaken by participating enterprises	—	—	0.150 <sup>e</sup>	—	0.150
4.3 Budget of the Project Management Unit	—	—	0.100 <sup>f</sup>	—	0.100
4.4 Provision for 3R Scheme (reserve)	—	—	0.050 <sup>g</sup>	—	0.050
<b>Total</b>	<b>—</b>	<b>—</b>	<b>2.300</b>	<b>—</b>	<b>2.300</b>

NBF: Not Bank-Financed

- a. Funds will cover the costs of minor civil works required to retrofit existing facilities.
- b. Consists of the following: International Shopping: US\$0.500 million; and Local Shopping: US\$1.000 million.
- c. Services to be procured in accordance with World Bank guidelines: "Use of Consultants by World Bank Borrowers and by the World Bank as Executing Agency Washington, D.C., August, 1981".
- d. Fee for services provided by the financial intermediary (2.72 percent of value of sub-projects 1, 2, 3, and 4) will be paid in accordance with agreed schedule: 1 percent upon Sub-Grant Agreement signature, 1 percent pro-rata to disbursements and 0.72 percent upon project completion.
- e. Funds to cover costs which will be incurred directly by the participating enterprises including in-house engineering and design work. Payments to be made directly to participating enterprises in accordance with sub-project cost estimates.
- f. Funds will cover the costs of office equipment, salaries and other operational expenses of the Project Management Unit (PMU) for a period of three years. Disbursements will be made on the basis of an agreed budget between the PMU and Financial Intermediary.
- g. Funds held as reserve to support operations of recovery/reclamation/recycling scheme. Disbursements to be made on the basis of a yearly review of the funding mechanism.
- h. Additional funding of about US\$0.3 million will be provided by the servicing enterprises who will participate in the recycling scheme.
- i. All items are financed by the Bank.

3. The table below sets forth the categories of items to be financed out of the proceeds of the GET Grant, the allocation of the amounts of the GET Grant to each category, and the percentage of expenditures for items so to be financed in each category:

<b>Category</b>	<b>Amount of the GET Grant Allocated (Expressed in SDR Equivalent)</b>	<b>Percentage of Expenditures to be Financed</b>
Goods, Works and Services for Part A.1 of the Project	60,000	100 percent of foreign expenditures and 100% of local expenditures (ex-factory cost)
Goods, Works and Services for Part A.2 of the Project	780,000	100 percent of foreign expenditures and 100% of local expenditures (ex-factory cost)
Goods, Works and Services for Part A.3 of the Project	350,000	100 percent of foreign expenditures and 100% of local expenditures (ex-factory cost)
Goods, Works and Services for Part A.4 of the Project	280,000	100 percent of foreign expenditures and 100% of local expenditures (ex-factory cost)
Goods, Works and Services for Part A.5 of the Project	230,000	100 percent of foreign expenditures and 100% of local expenditures (ex-factory cost)
<b>Total</b>	<b>1,700,000</b>	

## B. Disbursement

4. The Project is expected to be disbursed within a period of two calendar years. The Trustee will disburse against 100 percent of eligible foreign expenditures and 100 percent of eligible local expenditures (excluding taxes and duties) for grant financed goods and services contracts. Disbursement procedures have been established as follows:

- (a) Between the World Bank, the Ministry of Environment, and the Investicní a Postovní Banka: The Trustee will deposit an initial amount up to US\$300,000 to a Special Account which the MOE will open in Investicní a Postovní Banka. The minimum amount for replenishment of the Special Account will be US\$50,000. Requests for reimbursement will be based on Statement of Expenditures (SOEs) for contracts with a value of up to US\$50,000. The World Bank will accept requests for direct payment to the supplier of goods or services (not through a special account) only above a minimum of US\$25,000. Terms, conditions and schedule for disbursement for sub-projects 1, 2, 3, and 4 must be included in the sub-grant agreement between the Investicní a Postovní Banka and the enterprise; and
- (b) Between Investicní a Postovní Banka and the Sub-grant Recipient: Up to US\$100,000 per contract, Investicní a Postovní Banka will disburse to the sub-grant recipient for eligible expenses without prior review by the World Bank. Disbursement will follow the guidelines established in the Disbursement Handbook published by the World Bank in 1992. Details of the disbursement procedures will be included in the initial Disbursement Letter to be issued by the World Bank.

Expenses incurred for activities of the FI will be covered through the Special Account.

### ESTIMATED DISBURSEMENT

	FY94	FY95	FY96
	----- (US\$ thousand) -----		
Annual	200	1500	600
Cumulative	200	1700	2300

**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**SCHEDULE C  
TIMETABLE OF KEY PROJECT PROCESSING EVENTS**

(a)	Time Taken to Prepare:	7 months
(b)	Prepared By:	Bilal Rahill, ENVGC Mark Kosmo, EC2EE
(c)	First Presentation to the Bank:	August 10, 1992
(d)	Appraisal Mission Departure:	August 1993
(e)	Negotiations:	July 1994
(f)	Planned Date of Effectiveness:	October 1994
(g)	Expected Date of Completion:	June 1996

**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**SCHEDULE D  
PROJECT IMPLEMENTATION SCHEDULE**

Planned Date of Signature:	August 1994
Planned Date of Effectiveness:	October 1994
Sub-project 1 for Engineering Assistance for ODS Phaseout:	By December 1994
Sub-project 2 for Design and Operation of a CFC Refrigerant Reclamation Facility and Establishment of Refrigerant Recovery Capabilities in the National Network of Servicing Companies:	
Phase I -- Establishment of Reclamation Plant at Spolek, and Training Center	By December 1994
Phase II -- Pilot program for Collection, and Evaluation	By June 1995
Phase II -- Collection and Recycling of Refrigerants	1994-1996, and Thereafter
Sub-project 3 for Introduction of non-ODS Refrigeration Technologies in the Commercial Industrial and Refrigerated Transport Sectors:	
Sub-component A -- Redesign of Open Drive Compressors	December 1994
Sub-component B -- Retrofit of Industrial Cooling System	June 1995
Sub-component C -- Conversion of Test-Facilities to Non-ODS Technology	December 1995
Sub-component D -- Preparation of Technical Manual	December 1995
Sub-project 4 for Introduction of Non-ODS Insulation Technologies in Cold Room Panel Manufacturing:	October 1995
Sub-project 5 for Assistance to the Project Management Unit:	1994-1996
Expected Date of Completion:	June 1996

**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

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Technical Annex:	1. Summary Table of Sub-project Components
	2. Description of Sub-projects
Attachments:	A. Document of Understanding

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**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**TECHNICAL ANNEX  
1. SUMMARY TABLE**

Sub-project Title and Description	Participating Enterprises	Ownership	Sub-project Impact	Type of ODS Used/Produced	Sub-project Costs (US\$ Million)	Proposed GEF Grant <sup>1</sup> (US\$)
1. Engineering Assistance for ODS Production Phaseout	Spolek	State	Phased shutdown of ODS Production (2000 t/yr)	CFC-11 CFC-12 CFC-113 CTC	0.080	0.080
2. Design and Operation of a CFC Refrigerant Reclamation Facility and Establishment of Refrigerant Recovery Capabilities in the National Network of Servicing Companies	Spolek, Ekotez, Kovoslužba, and Association of Refrigeration Technicians	State and Private	Recycling of up to 200 t/yr of CFC-11 and CFC-12 refrigerants	CFC-11 CFC-12	1.340	1.040
3. Introduction of non-ODS Refrigeration Technologies in the Commercial Industrial and Refrigerated Transport Sectors	Thermo-King-Frigera	Private	Phaseout of 110 t/yr of CFC-12	CFC-12	0.464	0.464
4. Introduction of non-ODS Insulation Technologies in Cold Room Panel Manufacturing	BHL, s.r.o.	Private	Phaseout of over 80 t/yr of CFC-11	CFC-11	1.911	0.363
5. Project Management Unit	Project Management Unit, MOE	—	—		0.300	0.300
Others: Financial Intermediary Fee (2.72 percent on Sub-projects 1-4)					0.053	0.053
<b>TOTAL</b>					<b>4.148</b>	<b>2.300</b>

<sup>1</sup>/ Includes Contingency

**CZECH REPUBLIC  
TECHNICAL SUPPORT AND INVESTMENT PROJECT FOR THE  
PHASEOUT OF OZONE DEPLETING SUBSTANCES**

**TECHNICAL ANNEX  
2. PROJECT DESCRIPTION**

1. This Project consists of an investment and a technical assistance component. This technical annex provides: (a) a summary table of sub-projects; and (b) a detailed description of sub-project components. The Document of Understanding that has been signed for the refrigeration/recycling/reclamation scheme (Sub-project) is presented in Attachment A. Additional reference documentation on the organizational aspects of the Project and on general World Bank guidelines have been included in a Project Implementation Manual which has been provided to the Project Management Unit and local financial agent.
2. The design and proposed implementation scheme of this Project have evolved from the findings and recommendations which emerged from the Country Program for the Phaseout of Ozone Depleting Substances. There are two (2) underlying strategies which have guided the elaboration of this Project. The first is that technical and financial assistance is most needed, and will have the most long-term impact on cost minimization to the Czech Republic's economy, in sectors where significant early retirement of goods and equipment could occur due to non compatibility with alternative substances. This is particularly applicable to the refrigeration/air conditioning industry, from which stems the significant importance of the 3R (recovery, reclaim and recycle) sub-project. Such a sub-project carries a higher level of risk in the short term but bears the most benefits in the medium and long term. The introduction of a national 3R network is also a strategic step in phasing out the production of ODS. The establishment of a Technical Advisory Group will also foster early adoption of non-ODS technologies in sectors where significant ODS can be phased out but which cannot be reached by direct investment through this project, because they do not meet the general project eligibility criteria. This consists in the second strategy. This approach will maximize both the global (through rapid phaseout of ODS) and national (through the facilitation of technological upgrade) benefits.

**Investment Component**

**Sub-project 1: Engineering Assistance for ODS Production Phaseout**

**Background**

3. Spolek Chemical Works is the oldest chemical company in the Czech Republic. Its product line consists of basic inorganic and organic chemical agents (including CFC-11, CFC-12, CFC-113 and carbon tetrachloride), synthetic resins, organic dyes and intermediates, and surfactants (industrial auxiliary agents, and household and cosmetic products including aerosol sprays). Annual sales are approximately US\$100 million. Production of CFCs accounts for only a small portion of the revenues (less than 1%) and of the chemicals produced by Spolek. Nonetheless, CFC production has been important to the company. Spolek can produce up to 2000 t/y of CFC-12 (from a carbon tetrachloride [CTC] feedstock produced at the plant), with small amounts of CFC-11 and CFC-113 as by-products. Spolek is able to produce the above-mentioned products at less than half the price of West European producers, primarily due to lower labor costs, low capital depreciation costs (given the age of the equipment) and a relatively low overhead mark-up. The production break-even point has been estimated at 600-700 tons per year.

### Sub-project Objective

4. The objective of this project is to phase out the production of CFC-11 and CFC-12 (2,000 tons per annum) and carbon tetrachloride (5,000 tons per annum) at Spolek Chemical Works and develop a comprehensive strategy for CTC use or disposal.

### Sub-Project Description

5. The shutdown of CFC production in accordance with the Montreal Protocol and its amendments will create an imbalance in the production facility's plant material balance. CTC, which is produced as a by-product of epichlorohydrine production and used as raw material, will be produced in excess quantities. Presently, the only alternative available to the enterprise is to incinerate the excess CTC. This sub-project will fund a study which is to provide a comprehensive strategy for alternative uses of the CTC, or discussion of proper disposal methods.

6. Recently, the Czech government enacted a CFC production and import tax of 100 Czech Korunas (CK) (equivalent to US\$3.5) per kilogram of ODS. Spolek's 1994 production was scheduled to drop to 680 MT of CFCs and to 640 MT in 1995, but with the added tax, there is increased incentive to enact a recycling campaign to speed the production phaseout, as the recycled materials are not subject to the tax.

7. This sub-project will assist Spolek Chemical Works in determining the most suitable modification of the production process at Ústí-nad-Labem. In accordance with the restrictions on the manufacture of ODS mandated by the Montreal Protocol, and at the request of the Czech government, Spolek must determine the optimal method of compliance without seriously impacting its other operations. Spolek currently uses carbon tetrachloride and hydrofluoric acid from a propylene chlorination process. This sub-project involves a feasibility study by international experts into the most cost-effective modification of this production, possibly involving the production of the ozone-friendly refrigerants, which require hydrofluoric acid as a feedstock. The project includes a small market survey, and will address the problem of carbon tetrachloride disposal or use. This sub-project, therefore, consists of the following tasks:

- **Task 1:** Market Survey of Projected European CFC Substitute Production/Consumption Patterns;
- **Task 2:** Identify Alternative ODS Production Phaseout Strategies;
- **Task 3:** Evaluate Potential for Production of Other Hydrofluorocarbons (HFCs) and HCFCs Using Propylene, CTC, or Perchloroethylene (PCE) as Raw Materials; and
- **Task 4:** Development of Feasible CFC-11, CFC-12 and CTC Phaseout Strategy at Spolek.

8. In the next five years, Spolek plans to spend about CK1.8 billion on necessary environmentally-related projects (e.g., sewage treatment plant, refuse destructing plant, and stockyard). Funding for this sub-project will assist in the development of future company-wide environmental responsibility programs.

### Estimated Sub-project Costs

9. The total cost of this sub-project is US\$80,000, listed below by task as necessary for the production of the feasibility report.

**COSTS OF CONSULTANTS**

Task	No. of Man-days	Costs (US\$)
Task 1	20	20,000
Task 2	15	15,000
Task 3	30	30,000
Task 4	15	15,000
<b>TOTAL</b>	<b>80</b>	<b>80,000</b>

**Project Implementation**

10. This project will be implemented by Spolek Chemical Works over a three month period.

**Sub-project 2: Design and Operation of CFC Refrigerant Reclamation Facilities and Establishment of Refrigerant Recovery Capacity in the National Network of Servicing Companies**

**Background**

11. In the Czech Republic the most significant CFC use sector is refrigeration and air-conditioning. For 1993, it is estimated that the refrigeration and air-conditioning sector consumed 687 Metric Tons, or 48 percent of total national ODS consumption.<sup>2</sup> It has been estimated that 3.0 million domestic refrigerators and 0.5 million home freezers are presently in use in the Czech Republic. Servicing and repair on existing systems requires approximately 700 t/y of CFCs.

12. The servicing of domestic refrigerators and freezers is performed by a network of servicing companies which are supplied by Kovosluzba, the former state-owned distributor of refrigeration supplies and gas, and Ekotez. The national servicing network has now been privatized and most servicing centers are now owner-operated. However, Kovosluzba has maintained its role as the dominant wholesale organization for refrigerants, equipment, spare parts and as a training organization for service technicians (in association with the Union of Refrigeration Servicing Technicians of the Czech Republic) and Ekotez has established itself as a key player in this sector.

13. The Czech Republic will establish a comprehensive national recovery/reclamation/recycling program for CFC refrigerants to meet short-term needs for CFCs after the production ban takes effect on January 1, 1996. The design and implementation of this program to provide service to these units will

<sup>2/</sup> A rough estimate of 1,430 tons of CFC consumption for the Czech Republic in 1993 is derived as follows from the 1991 figures in paragraph 4 of the main report: (i) Subtract consumption of CFCs in the aerosol subsector (1600 metric tons) and flexible foam subsector (39 tons) since consumption in these sectors has been eliminated; (ii) Subtract 370 tons of CFCs in refrigeration to reflect the Slovak share based on data provided by refrigeration enterprises in Slovakia, but assume no net reduction in the Czech Republic's CFC use in refrigeration since 1991; and (iii) Subtract 40% of CFC use in rigid foams and solvents to reflect Slovak share, but assume no net reduction in the Czech Republic's CFC use in these two subsectors since 1991. This yields a distribution of aerosols -- 0 tons (0.0%); refrigeration -- 687 tons (48.0%); solvents -- 593 tons (41.5%); and rigid foams -- 150 tons (10.5%).

coordinate the phaseout activities of three groups responsible for chemical production, distribution and servicing. Kovosluzba and Ekotez are responsible for wholesale refrigerant sales, equipment, spare parts and training of service technicians. The actual servicing is performed by a network of servicing companies whose technicians are members of the Union of Refrigeration Technicians, who are responsible for the recovery aspects of servicing. Spolek Chemical Works and Ekotez will handle chemical reclamation and recycling.

#### Sub-project Objectives

14. The objective of this sub-project is to establish a national CFC refrigerant gas recovery network, and to train refrigeration and air-conditioning service personnel. Training will focus on the use of ODS recovery equipment to eliminate ODS emissions during servicing of refrigeration and air conditioning systems.

#### Sub-project Description

15. This sub-project establishes a CFC refrigerant gas recovery and reclamation unit at Spolek Chemical Works whose CFC manufacturing operations are well suited for conversion to CFC reclamation. In this sub-project, Spolek will continue to use part of the CFC production facility to recycle CFCs, and then as production is terminated, new equipment will be purchased to expand recycling. The other participant in the project, Ekotez, is a private Czech company that distributes refrigeration system components. Ekotez will be responsible for the organization and operation of a second refrigerant recovery center near Prague and servicing routes that will utilize existing distribution routes and equipment in order to minimize expenditures.

16. Phase I will focus on all preparatory arrangements necessary to ensure the proper functioning of the entire project including compiling experiences of other countries, cooperating in the preparation of legislative regulations (if required) and implementation of the incentive system to encourage recycling (as per Document of Understanding). The first reclamation facility will be established at Spolek chemical Works, the training center will also be established with the participation of the Union of Workers and Organizations in Refrigeration and Air Conditioning. The anticipated input of used refrigerant is estimated at 150-200 t/year, in the third year of implementation. Phase I of this sub-project will consist in the following:

- Establishment of the first reclamation plant (for CFC-11 and CFC-12) at Spolek Chemical Works including reclamation equipment (tank, pumps, boiling tank, etc...), laboratory equipment (gas chromatograph, scales and testers) and cylinder handling equipment for a total cost of US\$253,000;
- Establishment of the training center (recovery units, testing kits, etc...), research visits to two European recycling centers, the establishment of a training program for the refrigeration technicians and a public information campaign for a total cost of US\$138,000.

17. Phase II is comprised of the following components:

- Establishment of a collection site (for all recovered materials) and reclamation unit (mainly for HCFC-22) close to the Prague metropolitan area including testing equipment (gas chromatograph, pumps, other testing equipment) at a cost of about US\$169,000;
- Purchase of 2000 empty gas cylinders (including color coding system) for use in the 3R network at a cost of US\$140,000;

- Retrofitting of 4 vehicles for establishment of extraction and collection of recovered material at a cost of US\$90,000;
- Financial incentive of about US\$400 for the purchase of 500 recovery units (average cost of unit about US\$1,000) by the servicing companies for a total of US\$200,000. The counterpart financing to be provided by the servicing companies will amount to over US\$300,000;
- Provision of a reserve of US\$50,000 to cover potential operating losses (due to start up of the 3R network) of the reclamation center at Spolek Chemical Works. The reserve was determined on the basis of a cash flow analysis and represents an amount which would cover part of the operational losses should very small amounts of CFCs be recovered.

18. Approximately 50 percent of all refrigerant recovery will be handled by trained repairmen and the rest by regional mobile extraction stations. In the case of industrial equipment, these stations will extract refrigerant directly at a user's location; in the case of household appliances, collection will occur at local collection locations. Labels will be used to identify equipment from which CFC refrigerant has been removed.

19. Technician training will be conducted at the Vocational School Center in Kostelec nad Orlici, which is used as a training and retraining center for the entire Republic. The program will be conducted in cooperation with the Union of Refrigeration Technicians, which has 2,500 registered members. During the training program, the vocational school students will be also be instructed in the new repair procedures to prevent refrigerant emissions during servicing.

#### **Project Costs and Implementation**

20. The cost for this sub-project totals US\$1,040,000. The costs are broken down as follows:

<b><u>Phase I</u></b>	Project Initiation	June-December 1994	US\$391,000 <sup>3</sup>
<b><u>Phase II</u></b>	Pilot program, evaluation	1994-1995	US\$649,000
	Collect/recycle refrigerants	1994-1996	

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<sup>3/</sup> Approximately \$145,000 in retroactive financing will be provided for training and rebates for CFC recovery units.

### **Sub-project 3: Introduction of Non-ODS Refrigerants in the Commercial, Industrial and Refrigerated Transport Sectors**

#### **Background**

21. The Research Institute of Refrigeration Engineering (RIRE) is now part of the Czech Republic's largest manufacturer of commercial transport refrigeration equipment -- Thermo-King-Frigera, s.r.o.. This company is also the only producer of equipment for refrigerated transport for truck and trailer units which supplied the former Soviet Union. Frigera recently entered into a joint venture with the largest refrigerated transport company in the world (the American-based Thermo-King), which owns a 69 percent share in the joint venture. This has brought substantial stability to the former Frigera which had suffered two consecutive years of operating losses.

22. Thermo-King-Frigera is the largest commercial and transport refrigeration company in the Czech Republic, with revenues are approximately CK109.5 million (US\$3 million) in 1992. It produces open drive and semi-hermetic compressors, and designs and installs transport refrigeration units. Thermo-King-Frigera has an environmental test chamber for refrigerated trucks (one of only 11 in Europe and the only one in Eastern Europe), as well as a research institute which is the coordinating body for this project.

23. CKD Compressors (CKD-C) is a state-owned joint stock enterprise involved in the production of industrial refrigeration systems, including the manufacture of compressors, small heat exchangers and pressure vessels, as well as complex cooling circuits and centrifugal and rotary screw chillers. CKD-C plans to retrofit their refrigeration units to use HFC-134a as refrigerant.

#### **Sub-project Objective**

24. The objective of this sub-project is to establish prototype HFC-134a transport refrigeration units, and to establish retrofit techniques for existing commercial and industrial refrigeration equipment.

#### **Sub-project Description**

25. The purpose of this project is to assist Thermo-King-Frigera in modifying its product line for use with alternate refrigerants such as HFC-134a. The project involves two participants, Thermo-King-Frigera and CKD Compressors. The proposed sub-component elements to be implemented by Thermo-King-Frigera will develop refrigerated transport systems using HFC-134a, retrofit a CFC-12 industrial cooling system to HFC-134a (demonstrations at CKD-C), convert Thermo-King-Frigera's test facilities to a non-ODS alternative; and preparation of a technical manual for the retrofit of industrial cooling equipment. The project results will be used by producers of refrigeration systems and by the organizations providing for the servicing, maintenance and repair of refrigerating systems.

26. Sub-component A. Thermo-King-Frigera will design its open drive CFC-12 compressors to HFC-134a technology. These units are used to manufacture block cooling units for transport use. This project will also entail the retrofitting of existing CFC-12 compressor refrigeration systems for HFC-134a and polyester lubricants. Equipment for testing the retrofit method will include two leak detectors, a trace moisture analyzer, refrigerant exhaust equipment, and a refrigerant recycling machine.

27. Sub-component B. The cooling equipment currently used in this testing station runs on CFC-12, (400 kg charge). The compressor is an old reciprocating machine of Czech manufacture. Because of the system's multiple, unidentifiable leaks, it is not possible to implement a CFC-12 retrofit program. Retrofitting the system for HFC-134a is also an unsuitable option due to the system's complex circuit, which makes it difficult to ensure the complete removal of mineral oil lubricant. Thermo-King-Frigera

will convert the system to R 401B (SUVA MP 66), dismantle the system to eliminate leaks, and optimize the system (modify heat exchangers, vessels, control valves, etc.) or will use a drop-in substitute, whichever is most cost-effective.

28. Sub-component C will introduce procedures for retrofitting existing CFC-12 refrigeration systems for use with HFC-134a. Both Thermo-King-Frigera and CKD-C will retrofit their refrigeration units with HFC-134a in their workshops; test cleaning procedures for HFC-134a equipment (look at results of improper maintenance on HFC-134a systems), and conduct field tests. Thermo-King-Frigera has identified three customers of its equipment willing to participate in the field testing, and CKD-C will retrofit a CFC-12 screw compressor of a heat pump and turbo refrigeration unit with HFC-134a. Refrigerant leak detectors, moisture testers, and flow-rate meters will be used for both the Thermo-King-Frigera and CKD-C portions of the sub-project. A refrigerant recovery machine will be purchased to minimize emissions during testing.

29. Sub-component D. Thermo-King-Frigera will write a Technical Brochure to provide specific retrofit information and procedures to follow for systems using refrigerant HFC-134a. The brochure will also contain general information on stratospheric ozone depletion.

### **Project Costs and Implementation**

30. Total cost of this project is US\$464,000 and will be implemented over the period 1994-1996.

### **Sub-project 4: Introduction of non-ODS Insulation Technologies in Cold Room Panel Manufacturing**

#### **Background**

31. The Czech Republic has a well-developed refrigeration sector which produces a range of refrigeration equipment, insulating panels, components for automobiles, and insulated pipes. The main activity in this country's foams sector involves rigid foams. All flexible polyurethane (PU) foam blowing systems in the Czech Republic are expected to be imported for use with new or reconstructed technological lines. The use of rigid foam for refrigeration purposes in the Czech Republic is currently estimated at 1800 MT, almost 15 percent of which is produced by Bratři Horákové, s.r.o. (Ltd.) (BHL). The former CSFR consumed approximately 2,475 MT of foam in 1986, using 315 MT of CFC-11 as blowing agent. By 1996, the Czech Republic estimates that 3000 MT will be used in rigid foam applications.

32. BHL is the largest manufacturers of PU foam panels in the ČR: with a market share of about 40 percent of foamed panel production in the Czech Republic, it is the largest single operator in a sector including about 11 companies. Founded in 1898, and nationalized in 1948, BHL was recently restored to the original family owners. It currently employs 170 people, and produces approximately 240 tons of rigid foam per year using about 31 MT of CFC-11 as a blowing agent. Estimated investment costs for the introduction of non-ODS technologies are approximately CK55.4 million (US\$1.9 million). The company has already invested CK32.7 million in new panel production equipment.

#### **Sub-project Objective**

33. The objective of this sub-project is to convert BHL to 50 percent reduced CFC blown foam, in the remaining applications and eventually to retrofit current equipment to non-CFC foaming technologies.

#### **Sub-project Description**

34. The rigid insulation sector account for approximately 10-11% of ODS consumption in the Czech Republic. The switch to non-ODS blowing agents in this sector can generally be accomplished in a 2 step approach.

- The first step will replace 50 percent of the CFC-11 with water. This is accomplished at relatively low cost, resulting in a slightly higher cost of the foam formulation which contains more resin. This step also includes plans to design and construct a small laboratory for testing the properties (e.g., insulation firmness, CFC content, etc.) of proposed foaming systems. The construction of the testing laboratory involves the purchase of equipment which currently does not exist in the Czech Republic. The company is currently unable to test the thermal performance of its panels, and must rely on the guarantees of formulation suppliers. The laboratory will also be made available for the use of other panel manufacturers.
- The second step involves the switch from low-pressure (LP) blowing to high-pressure (HP) blowing equipment (or modification of the HP equipment) at significant incremental costs to the enterprise. It is estimated that this sub-project can be implemented in less than 1.5 years at a cost of US\$750,000 including a GEF grant of US\$363,000.

35. A large part of BHL's production consists of foamed Polyurethane (PU) panels, which are used in the construction of the coldstores. Technology was imported from Germany in 1983 for coldstore corner piece and door production (unheated moulds) and from Italy in 1991 for the wall panel production. The heated table in the Italian production line enables it to be used with 50 percent CFC formulations (already under production using formulations from Enichem [Italy]). This heated table will be used to introduce other reduced-CFC technologies through the adaptation of new moulds.

36. This sub-project will include assistance for technical training, testing and demonstration line and for the acquisition of the necessary technology to successfully convert to non-ODS blowing agents. Technical seminars on low-ODS and ODS-free technologies in the rigid foam sector. Demonstration project at the BHL facility where the HP panel press line is suitable for testing of alternative foam formulations and blowing agents. Investment support for the acquisition or retrofits of HP foam blowing units for use with HCFC-22/142b or HCFC-141b and eventually with HFC-134a or cyclopentane or other acceptable blowing agents.

#### **Project Costs and Project Implementation**

37. The new panel production line has already been purchased, representing an investment costs of CK48.52 million. The total incremental cost has been determined to be US\$0.363 million, exclusive of the technology upgrade investment already made by the enterprise.<sup>4</sup>

38. The BHL Company will coordinate this sub-project. Project preparation was carried out in connection with PROINCOM and the MOE. COWIconsult will also appoint a consultant who will cooperate with BHL.

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<sup>4/</sup> Approximately \$53,000 in retroactive financing for testing of non-CFC foams and production of pilot foams will be provided.

### Sub-project 5: Set-up of a Project Management Unit (PMU)

#### **Background**

39. The Department of Air Protection of the Czech Ministry of Environment (MOE) is responsible for the Czech Republic's accession to the Montreal Protocol and the adjustments and amendments thereto. The Department of Projects will, however, supervise the implementation of sub-projects 1, 2, 3, and 4 through the creation of a Project Management Unit (PMU) within the MOE. Outside consultants and assistance will be contracted by the PMU, as necessary.

40. A Project Management Unit (PMU) is needed to coordinate project management and implementation with the World Bank, the Financial Intermediary, and the Participating Enterprises. The PMU will supervise sub-project implementation, including procurement and disbursement, and providing guidance and support the Technical Advisory Group. Finally, the PMU will be needed to assist the Ministry of Environment in preparing documents for the Czech government concerning compliances with the Montreal Protocol, and in coordinating other multilateral and bilateral ODS phaseout efforts.

41. A Technical Advisory Group (TAG) is needed to assist CFC-using enterprises, with initial focus on the aerosol, flexible foam and solvent sectors where the new non-ODS technology is generally commercially available but are not being implemented mainly for economic reasons. The TAG will assist in preparing project proposals, in seeking joint venture partners whenever appropriate and in organizing demonstration projects with suppliers of alternative substances or ODS-free technologies. Secondly, the TAG will advise the Government on monitoring the status of ODS reduction on a national and project-specific basis.

42. Local staff and international consultants will be hired using funds from the operating budget. Consultants will be hired when appropriate to conduct technological assessments and prepare bid packages for companies seeking to get quotes on their ODS substitution projects; for the organization of technical seminars; for technical exchange programs and for specific institutional capacity building.

#### **Project Objective**

43. The objective of this sub-project is to support the establishment of a Project Management Unit within the Ministry of Environment which will provide institutional, organizational, and administrative support to the technical departments of the Ministry of Environment and assist ODS-using industries to develop and implement ODS phaseout projects. The Technical Advisory Group, on the other hand, will provide technical support to these same organizations.

#### **Project Description**

44. To successfully phaseout of ODS, the Czech Republic will need to:
- (a) Write a new Action Plan;
  - (b) Strengthen the institutional capacity of the Ministry of the Environment to undertake a national phaseout program;
  - (c) Develop and expand an ODS monitoring system for the Czech Republic;
  - (d) Provide information and technical support to industries affected by ODS phaseout;
  - (e) Create a business environment supportive of ODS phaseout; and

- (f) Complete the regulatory regime to restrict ODS production and consumption, and promote the use of reclaimed ODS and new ODS alternatives.

45. This sub-project has two components: (i) establishing a Project Management Unit (PMU), and (ii) organizing the ODS Phaseout Technical Advisory Group (TAG). Many of the activities that will be sponsored by the PMU as a part of this sub-project will be undertaken in cooperation with other departments of the Ministry of the Environment, the Ministry of Industry and Trade, universities and research institutes.

The PMU will be responsible for the following:

- Central administration and organization of project implementation in accordance with the GET Grant Agreement and the Project Administration Agreement.
- Control over utilization of financial means for investment sub-projects 1, 2, 3, and 4 according to the agreements mentioned above.
- Overseeing procurement and disbursement for sub-projects 1, 2, 3, and 4 in compliance with World Bank guidelines and in close cooperation with the Investiční a Postovní Banka.
- Central record-keeping of documentation which may need to be made available to the MOE and the World Bank.
- Consultations concerning the allocation of funds for the sub-projects with the Participating Enterprises and the Investiční a Postovní Banka.
- Preparation of any new legislation and regulatory controls for ODS consumption and which will be needed in the future.
- Taking part in the preparation of a new "Action plan for ODS phaseout" which would enable the development of a possible second GEF ODS Phaseout Project.
- Participating in the open-ended Working Group of the Montreal Protocol and coordinating other bilateral and multilateral phaseout efforts.
- Disseminating information on ODS and ODS-substitutes to manufacturers and consumers through technical seminars with affected trade organizations, the media, and written materials.
- Calling and ensuring meetings of the TAG if necessary, at a minimum of 3 times a year.

The TAG will be responsible for the following:

- Providing technical support and guidance to ODS producers and consumers in a way which will enhance the project coordination responsibilities of the PMU.
- Ensuring that suitable and competent technical expertise will be provided by external consultants for each of the investment sub-projects, as necessary.
- Disseminating technical information on each of the investment sub-projects to all concerned parties, and providing guidance concerning new project preparation.

### Project Costs and Implementation

46. The proposed GEF grant is for a total of US\$300,000 over a three year period. The cost is broken down as follows:

Investment Costs (includes office equipment)	35,000
Personnel Costs (1 full-time, 4 part-time staff)	66,000
Operational Costs (includes technical exchange travel)	199,000

47. This sub-project will be implemented under the supervision of the Ministry of Environment.

**ATTACHMENT A**

**DOCUMENT OF UNDERSTANDING**

# Document of Understanding Refrigerants Recovery, Recycling and Reclaiming Scheme in the Czech Republic

## Contents

This Document of Understanding (DoU) provides a description of organisational, institutional and economic issues of a Refrigerants Recovery, Recycling and Reclaiming Scheme for the Czech Republic as envisaged in the two sub-projects A.a.ii) - Reclamation and A.a.iii) - Recovery and recycling, both of which are part of the GEF-funded project "Phaseout of Ozone Depleting Substances in the Czech Republic" (7CKZGE003) presently under consideration by the World Bank. The DoU supplements the two sub-project documents A.a.ii) and A.a.iii) as framework documents for implementing the scheme.

The DoU is presented in the following sections:

1. Background and Objectives of the Scheme
2. Organisation and Refrigerant Flows
3. Financial Flows and Incentives of the Scheme
4. Government Supportive Actions
5. Endorsement of DoU

Annex 1: Financial Cash Flows for the Major Agents Involved in the Scheme

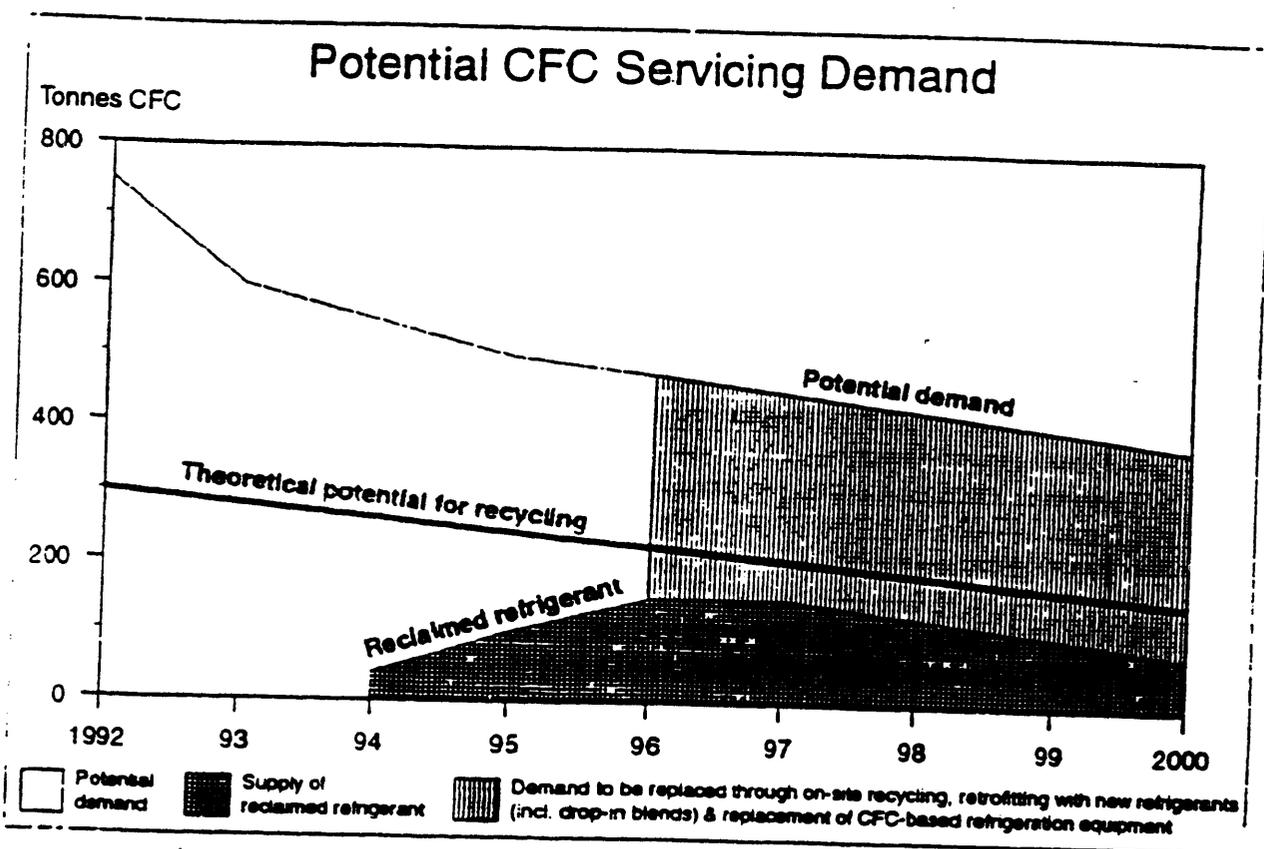
## 1. Background and Objectives of the Scheme

The Refrigerants Recovery, Recycling and Reclaiming Scheme is established in order to ensure the provision of CFC refrigerants for servicing of refrigeration equipment and in order to minimize the emissions of CFC resulting from servicing and dismantling of refrigeration equipment.

The CFC refrigerants stock in refrigeration equipment in the Czech Republic is presently in the range of 4,000-5,000 tonnes. The majority of this CFC-based equipment has a technical lifetime extending beyond the year 1995 when new CFC refrigerants will no longer be available. In this perspective CFC recovery, reclaiming and recycling is an option for ensuring a CFC supply for servicing purposes until retrofitting or replacement of the refrigeration equipment is economically and practically possible.

In 1992 some 700-800 tonnes of CFC was used for servicing of refrigeration equipment in the Czech Republic. The projected CFC demand for servicing towards year 2000 is illustrated in Chart 1, together with the estimated theoretical potential

for recovery and the projected volume of recyclable CFC to be achieved under the scheme. A quicker replacement or retrofitting of the present stock of CFC based refrigeration equipment will of course reduce CFC servicing demand and at the same time increase the potential CFC supply for recycling.



**Chart 1: Demand for CFC Refrigerants for Servicing in the Czech Republic**

It is projected that about 40 tonnes of reclaimed CFC can be made available through the pilot recycling scheme in 1994, increasing to 100 tonnes in 1995 and reaching a maximum level of 150 tonnes in 1996. Under this assumption reclaimed CFC will meet between 5% and 30% of the projected potential demand for CFC refrigerants for servicing. Until the end of 1995 the remaining CFC demand is likely to be met by supply of new CFC, but from 1996 the potential CFC demand exceeding the supply of reclaimed CFC will have to be met through recycling on-site, drop-in substitutes, retrofitting (change of refrigerant - to be introduced gradually from 1994) and replacement of CFC based refrigeration equipment.

In the initial phase of the refrigerants scheme to the end of 1995 there will be a gradual build up of the scheme. All service technicians will be offered free training, and all service enterprises will be offered subsidised recovery equipment. The reclaiming capacity build up in the scheme is believed to be sufficient for even a very optimistic assessment of the amount of recovered refrigerants for recycling. The newly approved law on ODS phaseout which contain a ban on emissions of ODS calls for a fast implementation of the refrigerants recycling scheme under close monitoring. A maximum of flexibility is needed for eventual adjustments of the scheme based on implementation experience.

## 2. Organisation and Refrigerant Flow

There are four major types of agents involved in the operation of the Czech refrigerants recycling scheme:

- refrigeration servicing enterprises;
- refrigerant suppliers;
- companies providing reclamation of refrigerants; and
- technical training institutions for service technicians.

Their individual roles in the recycling scheme are illustrated in Chart 2 and outlined in the following paragraphs. The role of the Ministry of Environment and other governmental bodies is described in Section 4.

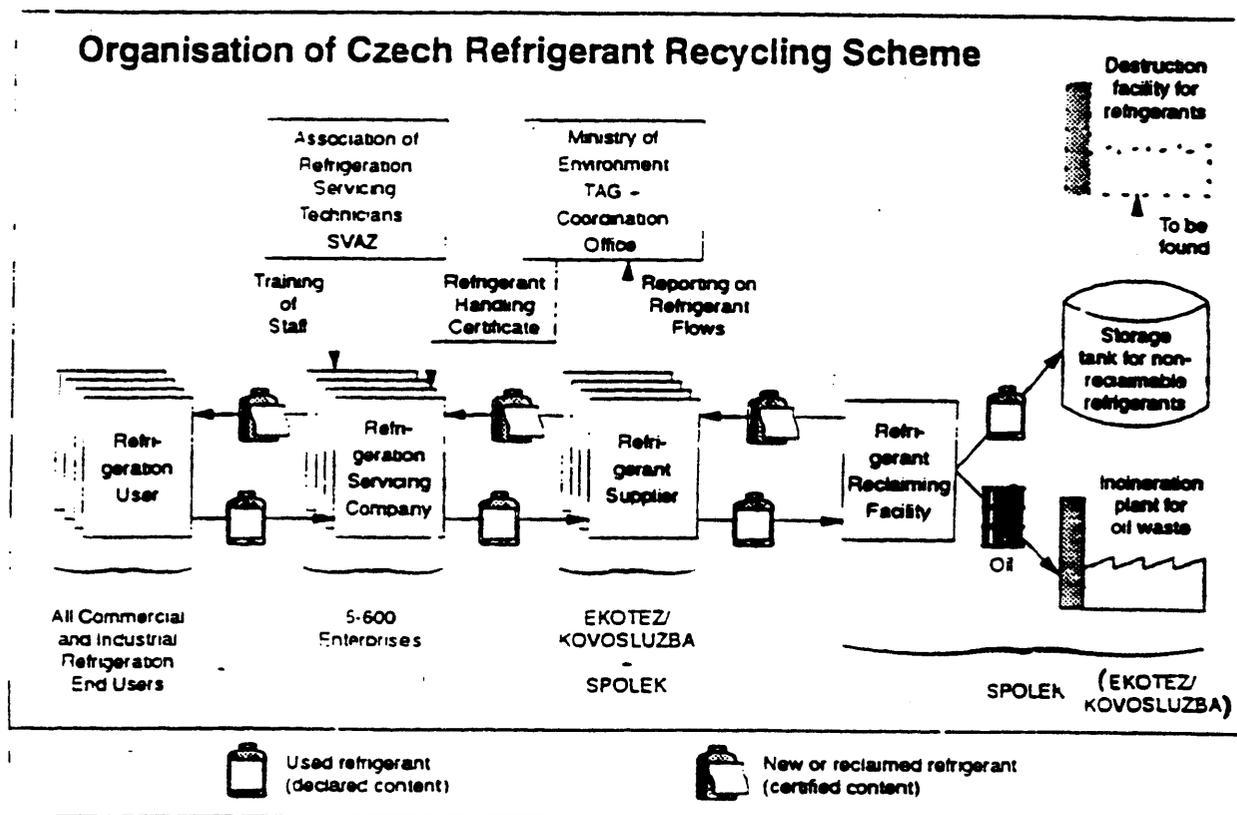


Chart 2: Organisation of the Refrigerants Recycling Scheme

The institutional and economic incentives for the various enterprises involved in the recycling scheme are outlined in Section 3.

### Refrigeration Servicing Enterprises

The refrigeration servicing enterprises will engage in the actual refrigerants recovery and recycling operations and store the recovered refrigerant for subsequent delivery to the refrigerant suppliers. This implies that the used

refrigerants will be returned to the suppliers typically in conjunction with the delivery of new refrigerants. The servicing enterprises will:

- recover refrigerants at servicing and dismantling of refrigeration equipment;
- store the refrigerant in cylinders with a label declaring the type of refrigerant content; and
- return the cylinders with recovered refrigerant to the refrigerant supplier.

The Association of Refrigeration Technicians, SVAZ, has a membership of approximately 1,700 authorised refrigeration technicians. In addition some 200-300 refrigeration repair workers are believed to be operating in the sector, registered only with a business license ("manufacture, installation and repair of refrigeration equipment") from the District Office for Small Enterprises. The total number of refrigeration servicing enterprises in the Czech Republic is likely to be in the range of 500-600. Most of the servicing enterprises are relatively small and all are newly formed following the first wave of privatisation. Formerly, the state enterprise KOVOSLUZBA-OTS was the major servicing agency, operating nation wide.

#### **Technical Training Institutions**

The training of service technicians in refrigerants recovery, recycling and other improved refrigerant handling practices will be carried out by the Association of Refrigeration Technicians in cooperation with one vocational school and a training agency. A training diploma, certifying the technicians' ability to handle refrigerants properly, will be issued by the Association. The training institutions will:

- arrange training sessions and plan curricula; and
- issue diploma to technicians who have successfully completed the training course.

The Czech Association of Refrigeration Technicians, SVAZ, will be responsible for the training and will in this endeavour cooperate with EducoCh a training agency in Praha and the Specialized Vocational School of Refrigeration in Kostelec nad Orlici. An initial training course for technicians in refrigerants handling and recovery operations will be offered to all 2,000 service technicians believed to be working in this field in the Czech Republic.

#### **Refrigerant Suppliers**

The refrigerant suppliers will arrange for transportation of recovered refrigerants from the servicing enterprises to the reclamation facility. Mobile recovery vehicles available at the refrigerant suppliers will assist in actual recovery operations at large industrial refrigeration facilities during servicing or dismantling of these large systems. The suppliers will be in a position to sell new refrigerants as well as offer the reclaimed refrigerants to the servicing enterprises. The refrigerant suppliers will:

- collect and buy back the recovered refrigerants from the servicing enterprises;

- participate in refrigerant recovery operations at large industrial refrigeration users;
- perform simple gas chromatographic analyses of recovered refrigerants and add this information to the labels on the refrigerant cylinders;
- deliver cylinders with recovered refrigerants to the reclamation facility;
- keep records of all refrigerant flows in the Republic and report to the environmental authorities, i.e. the Ministry of Environment; and
- offer certified reclaimed refrigerants to servicing enterprises.

Presently there are only two suppliers of refrigerants to the servicing enterprises. SPOLEK, the sole CFC producer in the Czech Republic, delivers refrigerants directly to a number of servicing enterprises, and provides about half of the refrigerants demand for servicing. The other half of the CFC demand at the servicing enterprises is covered by supply from KOVOSLUZBA-OTS/EKOTEZ. The latter company will in the pilot phase organise and operate one refrigerants recovery/collection centre.

KOVOSLUZBA, also a supplier of refrigeration equipment spare parts, imported in 1992 50% of their refrigerant supply and bought the other 50% from SPOLEK. In the future other sources of refrigerant supply might arise, even though the market for supplying the refrigeration servicing sector is not very attractive for major suppliers, owing to the small quantities demanded per enterprise. However the two present suppliers have agreed to handle all recovered refrigerants irrespective of their source of supply.

#### **Companies Providing Reclamation of Refrigerants**

The companies foreseen to undertake reclamation of refrigerants in the pilot phase is the CFC producer SPOLEK for CFC-12 and the collection centre run by KOVOSLUZBA/EKOTEZ for small amounts of other refrigerants such as HCFC-22 and CFC-12 contaminated with more than 10% oil. SPOLEK and KOVOSLUZBA/EKOTEZ will be responsible for analysis of the recovered refrigerants in order to determine their suitability for regeneration either as feedstock in the CFC production process at SPOLEK or in the small block reclamation unit (if oil content is higher than 10% or the oil is contaminated with PCB). A small block reclamation unit will be available both at the site of the CFC producer SPOLEK and at the recovery centre (KOVOSLUZBA/EKOTEZ).

The existence of PCB in refrigeration oils has not been proven. Even though PCB has not been found, there is a suspicion that some old refrigeration oils could contain PCB. Care will be taken to examine recovered oil in order to certify that no PCB has been used in refrigeration oils in the past in the Czech Republic.

SPOLEK will ensure storage of the non-reclaimable refrigerants until a solution for safe destruction is found (an appropriate chemical waste incineration facility is at the planning stage in the Czech Republic). The non-reclaimable refrigerants will comprise the refrigerant blends/mixtures and most likely also CFC-11 for which no market exists in the future. The refrigerant reclaimers will:

>

- accept the recovered refrigerants and sort the refrigerants through technical analysis into three groups:
  - (1) acceptable as feedstock in new CFC production,
  - (2) to be reclaimed in small block units, and
  - (3) non-reclaimable;
- reclaim refrigerants of groups (1) and (2);
- provide for storage of refrigerants of group (3) until an acceptable solution for destruction is found;
- provide for destruction of oil residues at SPOLEK's incinerator; and
- supply reclaimed refrigerants to wholesalers.

Chart 3 illustrates the possible classification categories of recovered refrigerants in the proposed recycling scheme (initial phase until the end of 1995). Used refrigerants are analyzed and sorted as to purity. Depending among others on the level of oil content and the content of foreign refrigerants (typically HCFC-22), the recovered refrigerant may be:

- accepted as a feedstock in the production of new CFC-12;
- reclaimed separately and sold for servicing (CFC-12 and HCFC-22); or
- stored for later destruction (refrigerant mixtures and possibly CFC-11).

After 1995 the reclaiming component of the refrigerant scheme will have to be adjusted, as the use of recovered CFC-12 as feedstock will be terminated together with the production of new CFC. At that time analysis will be conducted of the future CFC demand and various strategies for expanding the reclaiming capacity in the Czech Republic.

### Classification of Refrigerants in the Czech Recycling Scheme

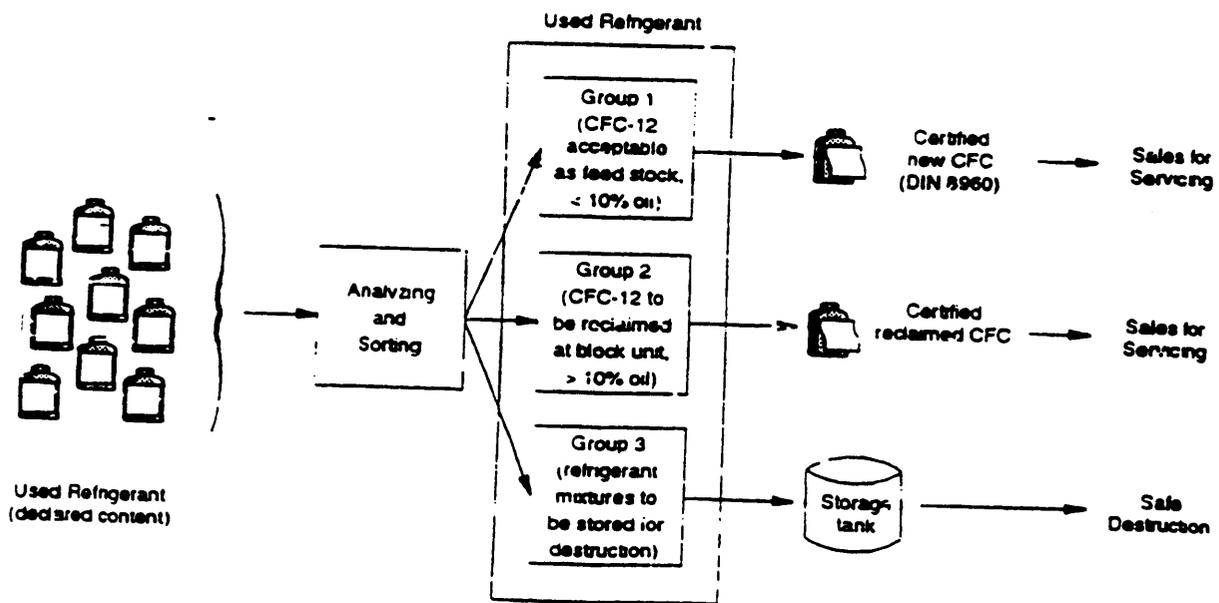


Chart 3: Refrigerant Flow in the Recycling Scheme

### 3. Financial Flows and Incentives of the Scheme

This section describes the refrigerant scheme in terms of the economic and institutional incentives for motivating the individual participants of the scheme. The financial flows between the participants in the refrigerants scheme are illustrated in Chart 4.

Cash flow projections for the major agents involved in the Refrigerants Recovery, Recycling and Reclaiming Scheme are presented in Annex 1. The exchange rate between the Kc and the USD applied in the analysis is 28:1. Further details on the economic and financial aspects of the refrigerant scheme are contained in the two project documents A.a.ii) on reclamation and A.a.iii) on the recovery and recycling operations.

Two of the major assumptions in the financial analysis of the refrigerant scheme are of course the volume of refrigerants to be recovered and the sales price on reclaimed/new CFC refrigerants. The assumptions applied here for the initial phase of the scheme (1994-95) are believed to be rather cautious. However, because of the uncertainty relating to the implementation of the refrigerant scheme in this initial phase a financial reserve for possibly underwriting of operations is suggested<sup>1</sup>.

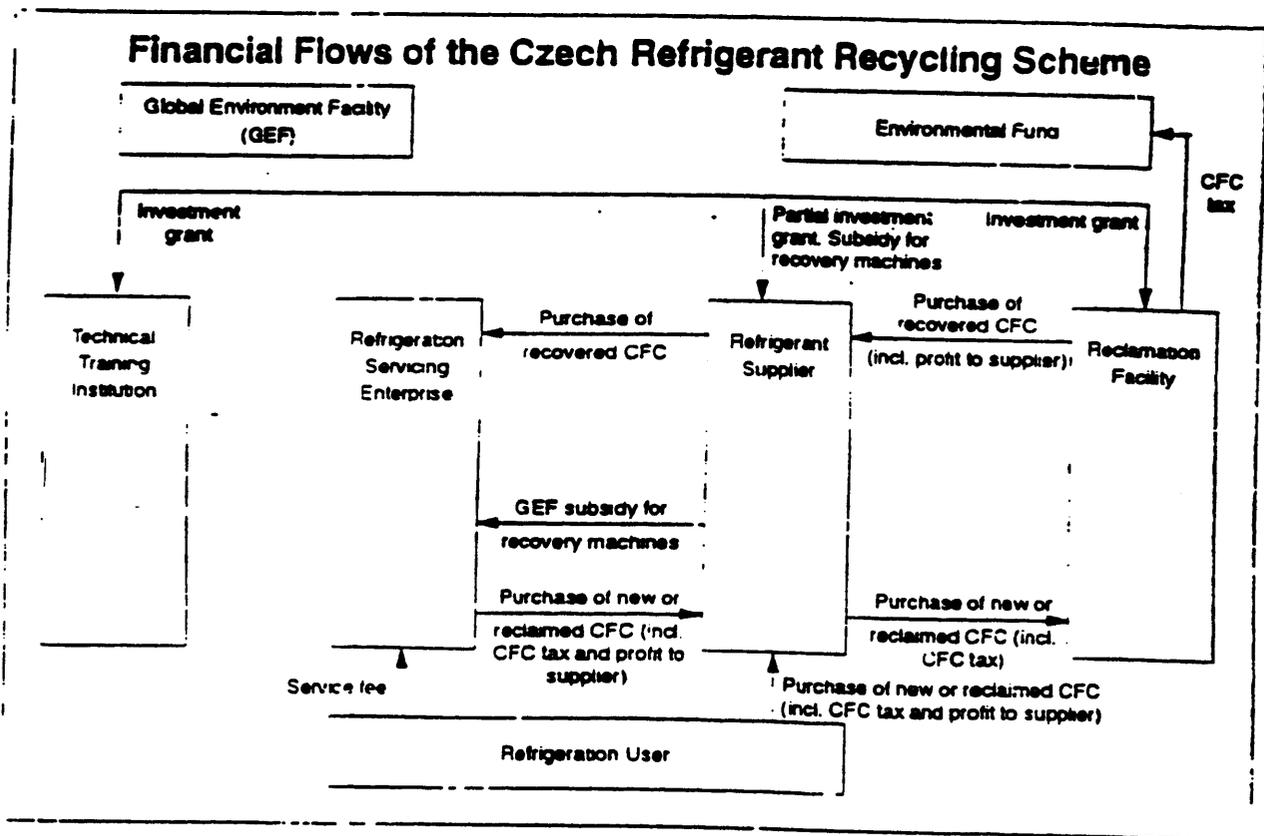


Chart 4: Financial Flows in the Recycling Scheme

<sup>1</sup> reserve amount of USD 50 000 from the GEF grant, administered by the ODS Technical Advisory Group and eventually applied to support the operations of the recovery centre.

## Refrigeration Servicing Enterprises

There are some 500-600 servicing enterprises and about 2,000 refrigeration technicians in the Czech Republic. The typical refrigeration servicing enterprise, defined as having an average of four refrigeration technicians, is envisaged to operate with one recovery machine. The volume of CFC handled is assumed to be the total volume of CFC handled in the Czech Republic divided by the number of servicing enterprises, say, 500.

Incremental cash outflows are envisaged in connection with (1) the acquisition of a recovery machine (USD 960), and (2) the labour and maintenance costs related to recovery of CFC<sup>1</sup>.

Cash inflows are expected in the form of:

- a GEF subsidy on the purchase price of a recovery machine<sup>2</sup>;
- revenues in connection with the sale of recovered CFCs back to the refrigerant suppliers of Kc 40 per kg;
- fees in connection with services rendered to refrigerant users<sup>3</sup>.

Refer to Table 3 of Annex 1, and to Chart 4.

As shown in Table 3, the incremental cash flows for a participating refrigeration servicing enterprise will, if service fees of Kc 150 per hour continue to be charged, result in a small cash surplus already the year after acquisition of the recovery machine. Over the four full years of operation an average refrigeration servicing company would have a net present value of the recovery operations of USD 1,200. The incentive or motivation for participating refrigeration servicing enterprises would thus be financial, free training, and access to reclaimed CFC, all of which translate into business survival in the longer run.

## Technical Training Institutions

The Czech Association of Refrigeration Technicians, SVAZ, has offered to be responsible for the training of service technicians. For its participation in the Refrigerants Recovery, Recycling and Reclaiming Scheme, SVAZ would receive a GEF grant, covering all of the initial training costs, including research visits to Denmark and Germany, and equipment for the Training Centre. Refer to Table 4 of Annex 1.

By participating in the Scheme, SVAZ would place itself in a strong position to conduct subsequent user-financed technician training courses related to new

<sup>1</sup> It is assumed that it takes between 15 minutes and one hour to recover one kg of CFC, depending primarily on the volume of CFC in the equipment to be serviced. The average wage is assumed to be Kc 40 per hour.

<sup>2</sup> GEF support is expected in the form of a subsidy on the purchase of a recovery machine: 50% of the purchase price for the first 250 participants and 25% for the next 250. Each of the 500 enterprises would thus receive at least USD 240 in GEF support.

<sup>3</sup> The average service fee is assumed to be Kc 150 per hour. It is further assumed that the additional time spent on refrigerant recovery can be charged to the client.

technological developments in refrigeration appliances and recovery/recycling equipment), using inter alia the knowhow and training equipment provided by GEF support.

### Refrigerant Suppliers

Table 2 of Annex 1 shows the combined cash flows of the refrigerant suppliers in the Refrigerants Recovery, Recycling and Reclaiming Scheme. These costs mainly comprise the establishing and operations of the refrigerant recovery/collection centre.

The refrigerant suppliers, KOVOSLUZBA/EKOTEZ and SPOLEK, are assumed to purchase recovered CFC at 40 Kc per kg and sell them to the reclamation centre at 50 Kc per kg. New and reclaimed CFC is assumed to be purchased from SPOLEK at the break-even selling price (see below), and sold to refrigeration servicing enterprises and other refrigerant users including a mark-up of 20%.

With the GEF grant to cover investment costs, the refrigerant suppliers would under the assumptions applied here be able generate a modest profit after the first two years of operations. However due to the uncertainty related to the amount of CFC which will be recovered and the CFC prices, a financial reserve of USD 50,000 is proposed to underwrite operations of the recovery/collection centre.

### Companies Providing Reclamation of Refrigerants

Table 1 of Annex 1 shows the cash flows of SPOLEK in connection with the company's participation in the Refrigerants Recovery, Recycling and Reclaiming Scheme.

With the newly approved CFC fee of 100 Kc, the price of CFCs will treble. Assuming that SPOLEK purchases recovered CFC at 50 Kc per kg, the company can without further price increases sell the reclaimed CFC at about three times this amount. With the investment grant from the GEF, this sales price generate a revenue which is sufficient to cover the full costs of CFC reclamation. Given CFC price developments elsewhere, a selling price of 145 Kc per kg in 1994 (increasing to 170 Kc in 1997) is not unrealistic.

Given the cash flows presented in Table 1 of Annex 1, SPOLEK would thus be in a position to continue supplying CFC refrigerants required by the refrigeration servicing sector, without incurring any losses itself. To the extent that world market prices for CFC increase further, it may be possible for SPOLEK to increase its selling prices and, thereby, generate profits.

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The refrigerant suppliers' selling price would increase to 140 Kc per kg in 1994 (SPOLEK's selling price, plus 20% mark-up) and continue increasing to 185 Kc in 1997. Given price developments for CFC elsewhere, this price is not unrealistic.

Under the applied assumptions the internal rate of return on the refrigerant suppliers' recovery/recycling operations is calculated at 15% over the period 1993-95.

#### **4. Government Supportive Actions**

A number of institutional issues relating to the refrigerant scheme are to be addressed by the Government, and these are briefly described in the following paragraphs. Some of these Government actions are general Government provisions already well under way with the approval of the new Law on ODS phaseout, while others are specific actions required to support the refrigerant scheme.

- implement refrigerant emission ban;
- implement CFC fee/import duty;
- implement ODS licensing system;
- cater to safe destruction solution for refrigerant waste;
- institutionalise refrigerant handling certificate;
- consider support for establishing an improved funding mechanism;
- institutionalise reporting requirements on refrigerant flows;
- provide information dissemination to enterprises and general public.

A law on ODS phaseout was approved in Czech Parliament in July 1993. The law establishes a ban on the emission of ODS, thus providing a legal basis for enforcement of refrigerant recovery during servicing of equipment. Furthermore the law includes the introduction of a CFC production fee and import duty of 100 Kc per kg of ODS. This import duty will raise current CFC prices by about 200%. This CFC price increase naturally improves the economic viability of the refrigerants scheme.

A decree by the Ministry of Environment has introduced an ODS licensing system, whereby both producers and consumers of ODS have to apply for licences through the Government'. Licences will be issued on the basis of the following criteria: (1) only present ODS consuming industries are eligible, and (2) the refrigeration sector is first priority, foam sector second, solvents and fire protection third, and aerosol sector is not eligible. It is assumed that consumption phaseout (at least until 1996) will take place faster than the Montreal Protocol's reduction requirements (with Copenhagen Amendments).

As the refrigerants scheme has not yet found an acceptable solution for the safe destruction of non-reclaimable refrigerants, the Government will have to assist SPOLEK in identifying an acceptable destruction facility. This could be within the framework of a planned chemical incineration plant prepared with PHARE funding. Until an acceptable destruction model is found the non-reclaimable refrigerants will be stored at SPOLEK premises.

The Government should also consider the desirability of including a certification provision for enterprises operating with the servicing of refrigeration equipment. Such a provision might stipulate that the issuance of a business license is contingent on the proven availability of refrigerant recovery equipment and the holding of training diploma ("safe refrigerants handling") of the technical

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The Government body responsible for issuance of licenses has not yet been identified, but it is assumed that it will either be the Ministry of Environment or the Ministry of Industry.

personnel. This could perhaps be done as an amendment to Law No. 455/1991 Coll. on business licenses. The Technical Advisory Group (TAG) and its coordination office under establishment in the Ministry of Environment could be made responsible for the issuing of refrigerant handling certificates to servicing enterprises. A certificate fee, which would cover the administrative costs involved, could be considered.

As mentioned, the law on ODS phaseout provides, with the fee/import duty on new refrigerants, an indirect financial support to the viability of the refrigerants scheme through higher prices on refrigerants. It is believed that these economic conditions (including the GEF grant) will be sufficient to ensure the economic viability of the scheme during the initial phase. However, the Government should monitor the economic viability of the scheme as implementation progresses and eventually intervene in the creation of a more favourable economic environment for refrigerants recycling if deemed relevant.

In relation to the monitoring of the refrigerant scheme, the Government should ensure that reporting guidelines on the refrigerant scheme are established. The refrigerant suppliers are likely to be the most attractive focal point for reporting on the scheme, and the TAG is the logical Government institution for monitoring of the scheme.

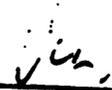
Finally, the Government should provide for a comprehensive information dissemination on the refrigerants scheme, both to the enterprises engaged in the refrigeration sector and to the general public - the inclusion of the latter being one of the major factors supporting the enforcement of the scheme.

Most of these Government actions will naturally fall under the auspices of the ODS Technical Advisory Group under establishment in the Ministry of Environment.

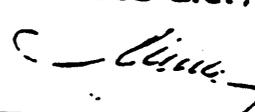
## 5. Endorsement of DoU

This Document of Understanding represents a common understanding among the participants of the organisation and functioning of the Refrigerants Recovery, Recycling and Reclaiming Scheme and the responsibilities assigned to and agreed upon by each of the participants.

For SPOLEK - United Chemical and Metallurgical Works Ltd., Usti nad Labem  
\_\_\_\_ September 1993

  
\_\_\_\_\_  
Alexej Vitek, Managing Director, Inorganics Division

For KOVOSLUZBA-OTS s.e., Praha \_\_\_\_\_ September 1993

  
\_\_\_\_\_  
Milan Blazek, Managing Director

For EKOTEZ Ltd., Praha \_\_\_\_\_ September 1993

\_\_\_\_\_  
Frantisek Janda, Managing Director

For SVAZ - Czech Association of Refrigeration Technicians, Praha \_\_\_\_\_  
September 1993

  
\_\_\_\_\_  
Bohuslav Spacek, Head of Secretariat

**Annex 1  
Financial Cash Flows  
for the Major Agents  
Involved in the Recovery,  
Recycling and Reclaiming Scheme**

Note:

To the extent possible, the cash flow figures presented in the following Tables reflect the figures supplied by the various agents in the Scheme. Certain figures may have been adjusted to ensure consistency in the methodology and assumptions used.

The figures given are very precise, and will be rounded off to the nearest 100 USD for Tables 1, 2 and 4, and to the nearest 10 USD for Table 3.

Assumed Exchange Rate:

1 USD : 28 Kc

Table 1: Incremental Financial Cash Flows, in USD, for the Reclamation Centre (SPOLEK)

	1993	1994	1995	1996	1997
<b>Volume of CFC Handled (tonnes)</b>	0	540	600	150	100
Reclaimed CFC	0	40	100	150	100
New CFC	-	500	500		
<b>Investment Costs</b>	<b>14400</b>	<b>215700</b>			
Design & management cost	5200				
Civil works	3500				
Operating machinery		121400			
Laboratory equipment		43200			
Handling equipment		27200			
Start-up costs		13900			
Contingencies	5700	10000			
<b>Operating Costs</b>	<b>0</b>	<b>2608085</b>	<b>2789888</b>		
Materials		462390	525937		
Purchase of recovered CFC		71429	178571		
Energy		39233	43389		
Salaries		43321	43321		
CFC fee to Env. Fund		1785714	1785714		
Other overhead charges		205998	212955		
<b>Total Cash Outflow</b>	<b>14400</b>	<b>2823785</b>	<b>2789888</b>		
<b>Cash Inflows:</b>					
GEF grant	14400	215700			
Sale of CFC, revenue inclusive of CFC fee 1)	0	2608085	2789887		
<b>Total Cash Inflows</b>	<b>14400</b>	<b>2823785</b>	<b>2789888</b>		

- 1) Sales price calculated backwards to provide full cost coverage (including a modest profit) for reclamation centre. Eventual further price increases on CFC refrigerants will naturally improve reclamation profitability.

Table 2: Incremental Financial Cash Flows, in USD, for the Refrigerant Suppliers and Recycling Agents (KOVOSLUZBA/EKOTEZ and SPOLEK)

	1993	1994	1995	1996	1997
Volume of CFC Handled (tonnes)	0	40	100	150	100
<b>Investment Costs</b>	<b>404000</b>	<b>41000</b>			
Specially designed tanks	140000				
Pump for liquids	5000				
Regeneration equipment	169000				
Vehicles	90000				
Total - PHASE 2	404000				
SPOLEK		41000			
<b>Operating Costs</b>	<b>185000</b>	<b>2822609</b>	<b>3109697</b>		
EKOTEZ/KOVOSLUZBA	5000	130000	140000		
SPOLEK		25000	31000		
Subsidy for recovery machines	180000				
Purchase of recovered CFC		59524	148809		
Purchase of new or reclaimed CFC from SPOLEK		2608085	2789888		
<b>Total Cash Outflow</b>	<b>589000</b>	<b>2863609</b>	<b>3109697</b>		
<b>Cash Inflows:</b>					
GEF grant for investments	404000				
Subsidy for recovery machines (GEF)	180000				
Sale of recovered CFC to SPOLEK		71429	178571		
Sale of new or reclaimed CFC to servicing enterprises		2772559	2990722		
<b>Total Cash Inflows</b>	<b>584000</b>	<b>2843988</b>	<b>3169294</b>		
<b>Net Cash Flow 1)</b>	<b>-5000</b>	<b>-19621</b>	<b>59597</b>		

1) This net cash flow in the initial phase of the refrigerants scheme results in an internal rate of return on this component of 15%.

**Table 3: Incremental Cash Flows, in USD, for the Average Refrigeration Servicing Enterprise**

	1993	1994	1995	1996	1997
<b>Volume of CFC Handled (kg)</b>	0	80	200	300	200
<b>Investment Costs</b>		960			
Recovery machine		960			
<b>Operating Costs</b>		107	213	284	233
Salaries 1)		57	143	214	143
Equipment maintenance		50	70	70	90
<b>Total Cash Outflow</b>	0	1067	213	284	233
<b>Cash Inflows:</b>					
Subsidy for recovery machine 2)		240			
Sale of recovered CFC to Centre		119	298	446	298
Service fees 1)		214	536	804	536
<b>Total Cash Inflows</b>	0	573	833	1250	833
<b>Net Cash Flow 3)</b>	0	-494	620	966	600
<b>Accumulated Cash Flow</b>	0	-494	127	1092	1693

- 1) It is in this calculation assumed that 1 kg of CFC can be recovered with an average additional time spent of 0.5 hour, and that this time can be fully charged to the client (the refrigeration users).
- 2) The GEF subsidy is assumed to be 50% of purchase price for the first 250 participants, and 25% for the second 250. The example shown assumes that the subsidy received is 25% of the purchase price. To the extent that a higher subsidy is received, the cash flows would improve.
- 3) This net cash flow results in an internal rate of return of 25% after two full years of operations.

**Table 4: Incremental Cash Flows, in USD, for the Training Institution (SVAZ)**

	1993	1994	1995	1996	1997
<b>Costs</b>	<b>55930</b>	<b>71000</b>			
Research visits	15500				
Training of technicians		52000			
Equipment	32430				
Public awareness campaign 1)	15000	15000			
Other expenses	4000	4000			
<b>Total Cash Outflow</b>	<b>66930</b>	<b>71000</b>			
<b>Cash Inflows:</b>					
GEF grant training	51930	56000			
GEF grant TAG's PAC 1)	15000	15000			
Training fee 2)					
<b>Total Cash Inflows</b>	<b>66930</b>	<b>71000</b>			

- 1) A Public Awareness Campaign (PAC) relating to ozone depleting refrigerants and proper handling will be conducted by the ODS Technical Advisory Group (TAG).
- 2) It is assumed that the initial training is financed 100% by GEF. However subsequent training of service technicians is likely to be user financed.