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Proposal for Review

Project Title:	**Slovak Republic: Elimination of Ozone Depleting Substances in the Production of Household Refrigerators and Freezers**
GEF Focal Area:	Reduction of Ozone Layer Depletion
Country Eligibility:	Montreal Protocol ratified on April 15, 1994 Entry into Force on July 14, 1994 (Czechoslovakia originally ratified the Protocol on January 1, 1993) GEF eligibility on the basis of IBRD eligibility.
Total Project Costs:	US$ 5.5 million
GEF Financing:	US$ 3.5 million
Govt. Counterpart Financing:	None
Cofinancing/ Parallel Financing:	IFC is considering assistance with privatization and potential financing for one or both beneficiary enterprises.
Associated Project:	None.
GEF Implementing Agency:	The World Bank
Executing Agency:	International Finance Corporation (IFC)
Local Counterpart Agency:	Ministry of Environment, Slovak Republic
Estimated Starting Date:	August 1995
Project Duration:	15 months
GEF Preparation Costs:	No PRIF or PPA resources were used

SLOVAK REPUBLIC: ELIMINATION OF OZONE DEPLETING SUBSTANCES IN THE PRODUCTION OF HOUSEHOLD REFRIGERATORS AND FREEZERS

COUNTRY/SECTOR BACKGROUND

1. **Introduction.** The Vienna Convention for the Protection of the Ozone Layer, 1985 (hereafter "Vienna Convention"), and the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 (hereafter the "Montreal Protocol") are international agreements which call for the phaseout of substances that deplete the stratospheric ozone layer (hereafter "regulated substances"). Over 80 countries representing over 95% of world consumption of these regulated substances have ratified the Montreal Protocol. The Slovak Republic ratified the Montreal Protocol on April 15, 1994, (with entry into force on July 14, 1994), succeeding to the ratification by the Czech and Slovak Federal Republic (CSFR) in October 1990. The Slovak Republic is fully committed to the complete phaseout of the production and consumption of substances which are regulated by the Montreal Protocol and subsequent London Amendments. The Slovak Republic has been designated a developed country for the purpose of the Montreal Protocol and is therefore not eligible for financial assistance from the Multilateral Fund for the Implementation of the Montreal Protocol (hereafter the "Multilateral Fund" or "MFMP") which has been set up to assist developing countries, with a per-capita ODS consumption of less than 0.3 kg, in the implementation of projects for the phaseout of ozone-depleting substances (ODS). The Slovak Republic is eligible for GEF funding under the Reduction of Ozone Layer Depletion component.

2. As part of an important regional study on environmental issues in Central and Eastern Europe (CEE), a comprehensive Country Program for the Phaseout of ODS in the CSFR (hereafter "Country Program") was undertaken in April 1992 and completed in November 1992. Given that the Slovak Republic is an important consumer of the regulated substances in CEE (CIS excluded), and a producer of household refrigerators supplying the Slovak and Czech Republics, it represents a challenge in developing a comprehensive national strategy to phaseout ODS usage by the year 1996, present Montreal Protocol deadline for developed countries.

3. **ODS Sector Background.** The CSFR's 1991 consumption of regulated ODS has been estimated at 3,934 metric tons (equivalent to 3,759 ozone-depleting-potential [ODP] weighted tons), which amounts to a per-capita consumption of 0.22 kg. It has been estimated that the Slovak Republic's consumption accounts for about 40% of the consumption in the former CSFR, while it does not produce any regulated substances. The 1991 ODS consumption profile for chlorofluorocarbons (CFCs) (referenced in Annex A, Group I, of the Montreal Protocol) for CSFR is as follows: 1600 tons (t) in the aerosol sector (1360 t of CFC-12, 224 t of CFC-11, 9 t of CFC 113 and 7 t of CFC 114), 1057 tons in the solvents and pharmaceutical sectors (mainly CFC-113), and 279 tons of CFC-11 in the flexible foam industry. Usage of Annex A Group II substances (Halon 1211 and 1301) was negligible, less than 10 tons, while consumption of Annex B Group II & III Substances (carbon tetrachloride and 1,1,1-trichloroethane which are common industrial solvents) has been estimated at 893 tons. The use of transitional substances such as HCFC-22 (used mainly in air conditioning applications) has been increasing, with 1991 consumption standing at 48 tons.

PROJECT OBJECTIVES

4. The principal objective of the project is to assist the Slovak Republic in the phaseout of ODS by early 1996 as mandated by the Montreal Protocol and its amendments and adjustments, in a cost effective manner. Specifically the goals of this project are to eliminate all the CFC-11 used in the domestic refrigerator sector, and about half the CFC-12 used in the domestic refrigerator manufacturing sector of the Slovak Republic.

5. **Project Strategy.** The largest single industrial user of CFC's in the Slovak Republic is the domestic refrigerator industry. This sector consumed a total of 248 metric tons of CFC-11 and 120 tons of CFC-12 in 1993. The implementation of these two projects will reduce this consumption by early 1996, in line with Slovakia's commitments under the Montreal Protocol.

6. **Project Benefits.** The project's major benefit will be to assist the Slovak Republic to achieve its objective of phasing-out the use of ODS as early as is technically feasible. It is expected that the project will contribute to the national objective of reducing ODS consumption of more than 280 tons per year directly after project implementation.

PROJECT DESCRIPTION

7. The Project consists of two sub-projects. A summary of each sub-project proposals is provided here. Comprehensive descriptions and relevant details are provided in Addendum A.

8. Both sub-projects relate to conversion away from use of CFCs in the manufacture of household refrigerators at the two companies manufacturing refrigerators and freezers in the Slovak Republic. Sub-project 1 will result in the elimination of 107 tons of CFC-11 and 44 tons of CFC-12 for as total of 151 tons per year in 1995 and beyond, while Sub-project 2 will eliminate 132 MT of CFC-11 per year starting in 1996. Details are provided in the sub-project descriptions included in Addendum A.

9. Both projects use widely accepted CFC substitute technologies. One sub-project proposes conversion of the refrigerant from CFC-12 to HFC-134a, and both projects propose conversion of the polyurethane insulation lines to using cyclopentane as the blowing agent instead of CFC-12.

10. Both companies possess considerable technical expertise, and are fully conversant with the technical issues involved. Considerable support in the conversion of the foaming process will be available from the technology suppliers. Technical risks to project success are thought to be almost non-existent.

11. The proposed project employs commercially available and environmentally acceptable technology. In addition, each project sub-component will be subject to local environmental regulations and oversight by IFC/World Bank. The project consists of light industrial projects which would be classified as category B on the basis of the IFC and Bank's project environmental

classification system and based on previous classification of similar projects. Potential environmental impacts include those associated with the flammability and air emissions characteristic of hydrocarbon-based non-ODS substitutes, and site specific impacts associated with manufacturing plant modifications.

12. **Key Project Documents.** The following is a list of documents relevant to the project and which are available on file with ENVGC.

A. Sub-Project Feasibility Study Documents

Sub-project 1: Implementation Plan for Freon Free Project, Samsung-Calex Co. Ltd., Slovak Republic, September 1994.

Sub-project 2: Full Substitution of the CFC-11 in the Refrigerator and Freezer Thermal Insulation made from the Rigid Polyuretan Foam, Calex Co. Ltd., Slovak Republic, September 1994.

B. Technical Reviews

- OORG STAP review of polyurethane foam conversion for both sub-projects, October and November 1994.
- OORG STAP review of refrigerant conversion for Sub-project 1, November 1994.
- Peer review of the two sub-projects, November 1994.

RATIONALE FOR GEF FINANCING

13. The project has been prepared and structured on the basis of specific ODS-phaseout requirements in the Slovak Republic and the project eligibility criteria guidelines, rules, and procedures, set forth by the Executive Committee of the MFMP and the GEF Scientific Technical Assessment Panel. Funding for this stratospheric ozone layer protection project is being sought from the GEF on the basis that the Slovak Republic:

. is eligible for GEF;
. is not classified as an Article 5 country and is not eligible for funding from the Multilateral Fund for the Implementation of the Montreal Protocol;
. has completed the preparation of a Country Program;
. has succeeded to the CSFR on the ratification of the Vienna Convention and Montreal Protocol on April 15, 1994, with entry into force as of July 14, 1994.

14. The sub-projects are consistent with international efforts in the field of ODS phaseout efforts and are deemed to be effective and required interventions in order to quickly and successfully phaseout the use of the regulated substances.

15. Another benefit is the replicability of project preparation and implementation mechanisms which will result from the processing and implementation of this first ozone-related project to be presented under the GEF for the conversion away from ODS in the Slovak Republic. In addition, this is among the first set of projects presented under GEF for the conversion of household refrigerator manufacture. The ultimate benefit of this project will therefore include accelerated phaseout of ODS in many CEE countries which may adopt policies and implement projects on the basis of the Slovak Republic's experience.

SUSTAINABILITY AND PARTICIPATION

16. The Project will be implemented within a limited time frame and with a defined budget. ODS phaseout projects which are successfully implemented will have a permanent ODS phaseout effect, which is further supported by the requirements of the Montreal Protocol to completely phaseout by the year 1996.

17. The Slovak government is currently drafting legislation that will (a) create a legal requirement within the Slovak Republic to cease using ODS, and (b) provide financial relief in terms of duties, taxes, etc., to the enterprises undertaking conversion away from ODS.

18. Strong sub-project ownership by the participating enterprises was encouraged very early in the project preparation phase. All sub-project documents were prepared by the participating enterprises with the support of the IFC/World Bank and its consultants. In addition, the enterprises have undertaken to provide/generate additional financing required to complete the capital-intensive component of the conversion. After the first year, the increase in operating costs will be reflected in the costing of the refrigerators and freezers.

LESSONS LEARNED AND TECHNICAL REVIEW

19. The proposed project is only the second GEF funded ODS phase out project to be initiated and, therefore, direct IFC/World Bank experience and associated lessons are limited. However, the World Bank, as an Implementing Agency of the MFMP (and the IFC as an associated Executing Agency) has implemented ODS phase out projects in many countries utilizing grant funding from the MFMP. A number of lessons have been learned from experience with these projects, and those of relevance were incorporated in the preparation of this project. These include the a) importance of a national phase out policy or Country Program as a basis for assuring commitment and ownership by the client country; b) value of strong enterprise/government linkages to achieve phase out objectives;c) value of project ownership at an early stage by the enterprises to achieve phase out objectives; and d) importance of technical support in the preparation and review of sub-projects.

20. External technical review of the sub-projects was undertaken by two OORG reviewers: G.M.F. Jeffs of ICI Polyurethanes reviewed the technical aspects of insulation conversion for both sub-projects (October and November 1994), and Lambert Kuijpers of the Dutch Technical University reviewed the conversion of the refrigeration circuits proposed in Sub-project 1 (November 1994). Internal technical review was conducted by Douglas Fenton, an engineer with IFC's Technical and Environment Department (November 1994). Mr. Fenton was also the technical specialist on IFC's financial appraisal team which conducted an in-depth appraisal of one of the beneficiary companies in March 1994 – as part of the debt/equity package being considered by IFC at the time.

PROJECT FINANCING AND BUDGET

21. The total project costs are $5.5 million which include the initial incremental capital costs and incremental operating costs for one year (including contingencies, but not including customs duties, excise, and other taxes). Of this, one sub-project will cost $3.1 million, and the second will amount to $2.4 million. Across the two projects, capital costs will amount to $3.6 million, and incremental operating costs for one year will be $1.9 million.

22. It is proposed that of the total project cost of about $5.5 million, $3.5 million be funded by the GEF under its Reduction of Ozone Layer Depletion component. This will fund $2.3 million in incremental capital costs and $1.2 million in incremental operating costs. The funding requested from GEF reflects compliance with the rules, procedures and guidance provided by the MP Executive Committee.

23. Funds will be provided as a grant from the GEF to the two enterprises in the Slovak Republic. The funds would be transferred by IFC under agreement with the two enterprises and with approval of the Slovak Government which has endorsed this project. The remainder of the project costs will be provided by the enterprises themselves.

24. Preparation of this project cost about $25,000, which was provided from IFC's GEF administrative budget. No additional PDF funds were utilized for the preparation of this project.

INCREMENTAL COSTS

25. Each sub-project involves incremental costs which would not have occurred in the absence of the Montreal Protocol. The estimated costs are to be considered incremental costs net of any potential savings. All estimated costs for the sub-projects have been determined to meet the definition of incremental costs (as determined by the London Amendment to the Montreal Protocol) as well as policies of the MFMP. These projects, are therefore, eligible for grant funding.

26. Although the eligible incremental costs amount to $5.5 million, only $3.5 million is being requested from GEF so as to account for partial foreign ownerships of the beneficiary enterprises, as well as to account for exports to countries ineligible for GEF assistance. The $3.5 million will fund $2.3 million in incremental capital costs and $1.2 million in incremental operating costs. The funding

requested from GEF reflects compliance with the rules, procedures and guidance provided by the MP Executive Committee.

27. The alternate technologies were chosen based on several criteria including costs and viability. Although HFC-134a does have a GWP, the use of this gas in refrigerators is small and is unlikely to have a significant impact on global warming, especially when compared to the amount of CFCs being eliminated. In terms of cost, the hydrocarbon alternative for refrigeration is viable and will cost at least the same as the chosen alternative, if not more. Because the foreign joint venture partner has substantial experience with HFC-134a, this was chosen as the preferred alternative by the enterprise.

28. The Unit Abatement Cost (UAC) across both projects is $7.54/kg/year. It should be noted that the UACs have been calculated using the entire project costs, i.e., including the costs not funded by GEF. UACs for the individual sub-projects, including separate UACs for the refrigeration and insulation components, are provided in the detailed descriptions included in Addendum A.

ISSUES, ACTIONS, AND RISKS

29. The CSFR's reduction in ODS consumption since 1989 has largely been a result of an economic slowdown and the collapse of the COMECOM trading block. GDP finally showed a positive rate of growth in 1994 for both Republics of the former CSFR, after nearly a 25% decline since 1990. This is projected to continue, with the Slovak Republic likely to show a slower rate of growth than the Czech Republic. In addition, recent reduction in ODS consumption in the Slovak Republic have also come about because of refrigerator manufacturers initiating conversion away from use of CFC, either to alternatives or reduced-CFC formulations. However, in an economic upturn, the purchase of consumer goods such as refrigerators and air conditioning equipments usually increase. The consumption of ODS could begin to increase again if no phaseout plan is implemented. The final economic cost to the country of the complete ODS phaseout could be significantly higher if no effort is made to actively pursue the complete and early phaseout of ODS.

30. Political, economic, and social changes in the Slovak Republic are likely to continue over the lifetime of this project. This brings to bear certain risks which must be addressed in both the design and implementation phase of the project. For example, the management structures and ownerships of the two companies which would be assisted under this project may change in view of privatization efforts being pursued by the Slovak government. One of the firms was established as a joint-venture with a foreign company, but with majority state ownership, while the other is wholly state-owned. However, both firms are currently discussing the possibility of further privatization. The IFC is also discussing a loan with the joint-venture company for expansion and modernization activities. Regardless of the outcome of the loan discussions, ongoing IFC supervision and review of the two projects will mitigate any risks associated with unexpected financial or management difficulties at any of the two companies.

31. Initial concerns over the possibility of market distortions which would adversely influence the trends in ODS consumption and phaseout have subsided. The concern was based on fears that dumping of ODS, which had been detected in many countries, could spread before the final ODS

production ban in developed countries. Mitigation measures on this front reside in the introduction of regulations (addressing import/export and usage), which ban the use of ODS in the various applications as the substitutes become available. These regulations are currently being drafted and reviewed by the Slovak government.

INSTITUTIONAL FRAMEWORK AND PROJECT IMPLEMENTATION

32. IFC (in arrangement with The World Bank) will be the executing agency for this project and will work with the two recipient of grant funds and the Slovak Ministry of Environment. The funds for implementation of the projects will be transferred to the enterprises by IFC after grant agreements have been signed between the enterprise and IFC. IFC will appraise the projects and oversee the implementation of the projects with ongoing supervision and review.

33. All procurement by the enterprises will follow competitive procurement guidelines consistent with MFMP requirements. All local works will be subject to normal local bidding procedures.

PROJECT MONITORING AND EVALUATION

34. The implementation of the project will be monitored and evaluated in the course of project supervision. In addition, the grant agreements signed by IFC after project approval with the companies will require periodic reports and certification of compliance with the various tenets of the grant agreement, which incorporate GEF requirements.

35. Safety issues related to the project have been addressed separately in the document.

Annex A: Technical Opinion

SLOVAK REPUBLIC: ELIMINATION OF OZONE DEPLETING SUBSTANCES IN THE PRODUCTION OF HOUSEHOLD REFRIGERATORS AND FREEZERS

SUMMARY OF TECHNICAL OPINION

1. Both sub-projects were reviewed in November, 1994. The STAP review was undertaken by a member of the Ozone Operations Research Group (OORG). The OORG was established by the World Bank to undertake the analysis of proposed sub-projects for funding the Multilateral Fund for the Montreal Protocol. It utilizes standard criteria against which to judge the technical viability and cost-effectiveness of sub-projects, as well as appropriateness of technology, environmental impact, project costs, implementation timeframe and safety issues.

2. The Samsung-Calex sub-project was approved immediately. The second sub-project, involving HFC-13A conversion was required for safety reasons.

ADDRESSING REVIEWERS' COMMENTS

3. The costs presented in this document exclude costs of a helium leak detectors requested by one of the enterprises (and included in feasibility study produced by the company). These costs were not approved by the OORG reviewer. Although the company has decided to still buy these detectors, these are not included in the costs shown here and will not be claiming as part of the grant. The contingency and UAC for the sub-project were also appropriately adjusted.

4. The incremental operating costs are estimates based on actual incremental costs during initial trials. As pointed out by the OORG technical reviewer, these costs may actually come down in the future as cyclopentane technology evolves. Although this may not necessarily happen by the end of 1996, financial arrangements with the enterprise will ensure that incremental operating costs are reimbursed based on actual costs incurred.

AVAILABILITY OF ORIGINAL TECHNICAL REVIEWS

5. The original technical reviews are available on file with Vikram Widge of IFC's Environment Division and the task manager for this project (fax # 202-676-9495), or from ENVGC, the World Bank (fax # 522-3256)

ADDENDUM A: SUMMARY DESCRIPTION OF SUB-PROJECTS

SUB-PROJECT 1: ELIMINATION OF ODS USED IN THE PRODUCTION OF HOUSEHOLD REFRIGERATORS

Background

1. The production of refrigerators and freezers in the Slovak Republic consumed 451 MT of CFCs in 1991. This consumption was associated with the production of refrigerators and freezers by the Calex Co., which was the only manufacturer in the Slovak Republic at the time. The consumption of CFCs declined to 248 MT in 1993, principally as a result of introducing 50% reduced CFC-11 foaming techniques. In the same year, two separate companies were formed from the previous single enterprise.

Company

2. Samsung-Calex is a joint venture company formed in 1993 between Calex (owned 100% by the Slovak government and also the proposer of sub-project 2) and the Samsung Corporation of South Korea. National Slovak ownership of the joint venture (through Calex' holding) is 55%. Samsung-Calex acquired about 250,000 of the 600,000 units/year production capacity possessed by the parent company. The new company initiated a program to modernize production which is also nearing completion. In addition, the company is planning to expand its production capacity and IFC is considering a loan to assist Samsung-Calex in this venture.

3. Production in 1993 was about 254,000 units, 19% of which were sold on the domestic market, about 35% to the Czech republic, and the remainder mainly exported to Western European countries. This production consisted entirely of existing Calex models. In late 1994, four new Samsung models were introduced to replace some of the existing models in production.

Project Objectives

4. The company intends to phase out CFC use entirely in accordance with the strategy described in the Czechoslovak country program. This involves replacing CFC-11 with cyclopentane as the foaming agent and CFC-12 refrigerant use with HFC-134a, thereby enabling Samsung-Calex to market a 100% CFC free refrigerator. Given that the greater part of their production is destined for countries which have banned the import of CFC containing appliances, this move is of the utmost importance for Samsung-Calex.

Project Description

5. The proposed project entails eliminating use of CFC-11 and CFC-12 in the production of refrigerators at Samsung-Calex. Production of refrigerators and freezers is being converted to using HFC-134a as the refrigerant and cyclopentane as the blowing agent. The project is divided into two phases: the first phase provides for modification of existing equipment for the cabinet

foam blowing line to use cyclopentane, and changes in refrigerant charging equipment, supply pumps, and leak detection equipment to successfully convert to using HFC-134a compressors. The second phase consists of replacing the door foaming line to be able to use cyclopentane as the current equipment, unlike the cabinet foaming line, is not amenable for use with just modifications.

6. The first phase of the project has already been implemented, namely replacement of CFC-11 by cyclopentane as the foaming agent in the cabinet foaming line, and the switch over to using HFC-134a as the refrigerant. The second phase, i.e., conversion to cyclopentane for the door foaming line and consolidation of HFC-134a use is underway and is planned for completion end-1994/early-1995. In effect, retroactive funding will ultimately be required for both phases.

7. The use of HFC-134a in place of CFC-12 as refrigerant involves the purchases of new charging equipment, leak detectors and a refrigerant supply pump. Changes to production largely involve ensuring that dehydration and oil handling procedures are adequate to cope with the acutely hygroscopic nature of the polyol ester oil used in HFC-134a based refrigerators.

8. The use of cyclopentane in place of CFC-11 as a foaming agent requires changes in product design because of the lower insulating value of cyclopentane blown foam, and the modification of foaming machinery and factory premises to accommodate the flammability of this hydrocarbon. This is discussed in more detail below.

9. Offers were sought from three equipment suppliers. The equipment supplier chosen (OMS) was selected as the result of a rigorous bid selection process which fulfills GEF and MP competitive procurement requirements.

(a) Modification of Existing Foaming Equipment

This involves the replacement of some components such as foaming heads which cannot be adapted to the safety requirements of the new process, and the modification others such as jig heaters which must be automatically de-energized when cyclopentane is introduced into the foaming jigs. The foaming heads must be equipped with a device which injects nitrogen into the molds to displace any remaining cyclopentane.

(b) Addition of New Equipment Items

Because of its flammability, concentrations of cyclopentane in air must be kept well below its flammability threshold in the factory area. In order to achieve this, areas where leaks can take place are enclosed in airtight booths which are maintained at negative pressures by a ventilation system that also has to be installed.

In addition, the cyclopentane/air concentration is continuously monitored by an alarm system that sounds an alarm and de-energizes production equipment when cyclopentane

concentrations exceed given thresholds. This system is equipped with a large number of sensors located throughout the area where foaming is taking place.

(c) Storage, Distribution, and Layout

New external storage for the foaming agent must be provided on account of its flammability. Also its distribution route through the factory must be changed to eliminate any possibility of accidental rupture.

(d) Modification of Refrigerator Design

Thicker insulation must be incorporated to ensure that energy efficiency of the new production is as good as that of the old CFC-12 refrigerators.

Principal Project Cost Elements

Incremental Capital Costs[1]

Phase 1

Modification of Cabinet Foaming Line	$596,100
Cyclopentane Storage and Distribution	$115,700
Purchase of Equipment for Conversion to HFC-134a Refrigerant	$67,800
Refrigerator Testing	$15,600
Training	$11,600
Sub-Total	**$806,800**

Phase 2[2]

New Door Foaming Line	$780,000
Purchase of Equipment for Conversion to HFC-134a Refrigerant	$143,790
Sub-Total	**$923,790**
Total Capital Cost	**$1,730,590**

[1] Costs presented here do not include import duties, excise or any other local taxes.

[2] The costs presented here exclude costs of a helium leak detectors requested by the company (and included in proposal available as documentation). These costs were not approved by the OORG reviewer. Although the company has decided to still buy these detectors, they will not be claiming these costs as part of the grant. The contingency and UAC have also been appropriately adjusted.

Incremental Operating Costs[3]	
Costs based on production for 1995	**$920,700**
Total Project Costs (including 15% contingency)	**US$ 3.1 million**
GEF FINANCING REQUESTED[4]	**US$ 1.1 million**

ODS Reduction and UAC

10. A total of 107 tons of CFC-11 and 44 tons of CFC-12 per year will be eliminated from production following project implementation by the end of 1994. The Unit Abatement Cost (UAC) for the project as a whole is $8.11/kg/year. ($14.48/kg for the refrigeration part and $5.49/kg for the foam part). These UACs are within acceptable limits of other similar MP-funded projects.

Safety Management

11. OMS, the equipment supplier selected by Samsung-Calex, are highly experienced in the provision of cyclopentane foaming systems. They have worked closely with Samsung-Calex to ensure the safe operation of the plant installed in Phase 1. A comprehensive safety management scheme is in place whereby an independent safety team are empowered to order production to shutdown if safety standards are breached. OMS will also be Samsung-Calex' "technical partner" for cyclopentane safety issues.

Implementation Schedule

12. The first phase of the project is complete. The second phase is currently being implemented and is likely to be complete by end of 1994. Full production of ODS-free refrigerators is anticipated by the start of 1995.

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[3] The incremental operating costs are estimates based on actual incremental costs in the first half of 1994. As pointed out by the OORG technical reviewer, these costs may actually come down in the future as cyclopentane technology evolves. Although this may not necessarily happen by the end of 1995, financial arrangements with the enterprise will ensure that incremental operating costs are reimbursed based on actual costs incurred. The company had originally requested incremental costs for 1994 and 1995 – however, based on MFMP policy of allowing incremental costs for a maximum of one year for refrigeration projects, incremental operating costs for only 1995 are being requested.

[4] The request for GEF financing is based on 55% Slovak ownership and reductions for exports to countries ineligible for grants. The eligible project costs have been reduced by 45% to account for foreign ownership. Based on last three years of sales data (1992-1994), Samsung-Calex exported an average of 47% of its production to industrialized countries (i.e., non-Article 5 and non-EITs) . The costs were further pro-rated by 63% (100 – 47 + 10) to account for these exports.

SUB-PROJECT 2: FULL SUBSTITUTION OF CFC-11 IN THE REFRIGERATOR AND FREEZER THERMAL INSULATION

Background

13. The production of refrigerators and freezers in the Slovak Republic consumed 451 MT of CFCs in 1991. This consumption was associated with the production of refrigerators and freezers by the Calex Co., which was the only manufacturer in the Slovak Republic at the time. The consumption of CFCs declined to 248 MT in 1993, principally as a result of introducing 50% reduced CFC-11 foaming techniques. In the same year, two separate companies were formed from the previous single enterprise.

Company

14. Calex is a 100% state-owned company. In 1993, a new company was formed as a joint venture with Samsung of South Korea. The original production capacity of the single company was about 600,000 units per year. After the formation of the joint venture, production capacity is now 350,000 – the remaining production facilities having been acquired by the joint venture company.

15. Production in 1993 was about 223,000 units, 39% of which were sold on the domestic market, about 38% to the Czech republic, 9% to other Eastern European countries, and the remainder mainly exported to Western European countries.

Project Objectives

16. The company intends to phase out CFC use entirely in accordance with the strategy described in the Czechoslovak country program. This involves replacing CFC-11 with cyclopentane as the foaming agent. This project will result in the conversion of the foaming process at the company's most modern production line. No further GEF funding will be requested to accomplish the conversion of the foaming process on the other lines. Replacement of CFC-12 refrigerant use with HFC-134a will be undertaken separately and funding for that is not requested as part of this project. The conversion of the refrigerant circuit will enable Calex to market a 100% ODS-free refrigerator. Given that the greater part of their production is destined for countries which have banned the import of CFC containing appliances, this move is of the utmost importance for Calex.

Project Description

17. The use of cyclopentane in place of CFC-11 as a foaming agent requires changes in product design because of the lower insulating value of cyclopentane blown foam, and the modification of foaming machinery and factory premises to accommodate the flammability of this hydrocarbon. The project consists of the following principal components:

(a) Modification of Existing Foaming Equipment

The general layout of the refrigerator foaming equipment will have to be changed. This will involve the replacement of some components such as foaming heads which cannot be adapted to the safety requirements of the new process, and other modifications, such as, jig heaters which must be automatically de-energized when cyclopentane is introduced into the foaming jigs.

(b) Addition of New Equipment Items

Because of its flammability, concentrations of cyclopentane in air must be kept well below its flammability threshold in the factory area. In order to achieve this, areas where leaks can take place are enclosed in airtight booths which are maintained at negative pressures by a ventilation system that also has to be installed.

In addition the cyclopentane/air concentration is continuously monitored by an alarm system that sounds an alarm and de-energizes production equipment when cyclopentane concentrations exceed safety thresholds. The system is equipped with several sensors located throughout the foaming area, both inside and outside the booths mentioned above.

(c) Storage, Distribution, and Layout

New external storage for the foaming agent must be provided on account of its flammability. Also its distribution route through the factory must be changed to eliminate any possibility of accidental rupture.

(d) Modification of Refrigerator Design

Thicker insulation must be incorporated to ensure that energy efficiency of the new production is as good as that of the old CFC-12 refrigerators.

Principal Project Cost Elements

Incremental Capital Costs[5]

Investigation and Project Works	$36,000
Reconstruction of Production Technology	$801,680
Local Equipment and Civil Works	$123,530
Building and Construction Modifications	$195,550
Modification of Refrigerator Design	$22,000
Refrigerator Testing	$18,400

[5] Costs presented here do not include import duties, excise or any other local taxes.

Worker Training	$76,470
Additional fire fighting equipment	$146,000
Total Capital Costs	**$1,419,630**
Incremental Operating Costs[6]	
Costs based on production for 1996	**$646,500**
Total Project Costs (including 15% contingency)	**US$ 2.4 million**
GEF FINANCING REQUESTED[7]	**US$ 2.4 million**

ODS Reduction and UAC

18. A total of 132 tons of CFC-11 will be eliminated in 1996 following completion of the project. This will rise to 176.5 MT as capacity production is reached. The Unit Abatement Cost (UAC) for the project is $6.89/kg/year. This UAC is within acceptable limits of other similar MP-funded projects.

Safety Management

19. Cannon, S.p.A., the equipment supplier selected by Calex, are highly experienced in the provision of cyclopentane foaming systems. They and the local consultants employed by Calex, Kovoprojeckta, will work with Calex both during and after project implementation to ensure the safe operation of the plant. A comprehensive safety management plan has been described by Calex whereby an independent safety team are empowered to order production to shutdown if safety standards are breached. Both companies will be Calex' "technical partner" for cyclopentane safety issues.

Implementation Schedule

20. Building reconstruction and line modification will commence within three months of the grant funds being made available. Final product and line testing will be completed within nine

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[6] As pointed out by the OORG technical reviewer, these costs may actually come down in the future as cyclopentane technology evolves. Although this may not necessarily happen by the end of 1996, financial arrangements with the enterprise will ensure that incremental operating costs are reimbursed based on actual costs incurred.

[7] The request for GEF financing is based on 100% Slovak ownership and no reductions for exports to countries ineligible for grants. Based on last three years of sales data (1992-1994), Calex exported an average of only 10% of its production to industrialized countries (i.e., non-Article 5 and non-EITs) . The proposed grant for Calex has not been prorated because up to 10% of exports to such countries is allowed.

months after start (along with worker training), allowing production to commence within a year or so after project approval.