



GEF

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Dear Council Member:

I am writing to notify you that we have today posted in the GEF's website at www.gefweb.org, a medium-sized project proposal from UNDP entitled *Lithuania: Elimination of Green House Gases in the Manufacturing of Domestic Refrigerators and Freezers at Snaige*. The GEF will contribute \$999,900 towards a total cost of \$2,493,900.

This project intends to eliminate all HFC consumption in the refrigerator and freezer manufacturing operations at Snaige through the conversion of HFC134a to iso-butane. The selected HFC-134a replacement technology is HC-600a, which is a preferred technology from an environmental point of view given that HFCs are greenhouse gases with a high GWP. The conversion to iso-butane will take place on a model-by-model basis so that Snaige will have the ability to implement hydrocarbon technology while the user demand for HC-600a and high energy efficient HC-600a models is increasing..

The project proposal is being posted for your information. We would welcome any comments you may wish to provide by November 21, 2001, in accordance with the procedures approved by the Council.

If you do not have access to the Web, you may request the local field office of the World Bank or UNDP to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

cc: Alternates, Implementing Agencies, STAP

UNITED NATIONS DEVELOPMENT PROGRAMME

GLOBAL ENVIRONMENT FACILITY

Medium-Sized Project Brief – Lithuania

PROJECT IDENTIFIERS	
1. <i>Project name:</i> Elimination of Green House Gases in the Manufacturing of Domestic Refrigerators and Freezers at Snaige	2. <i>GEF Implementing Agency:</i> UNDP
3. <i>Country or countries in which the project is being implemented:</i> Lithuania	4. <i>Country eligibility:</i> Eligible under paragraph 9(b) of the GEF Instrument. UNFCCC ratified on 24 March 1995
5. <i>GEF focal area(s):</i> Climate Change	6. <i>Operational program/Short-term measure:</i> Short-term response measure
7. <i>Project linkage to national priorities, action plans, and programs:</i> Lithuania ratified the UNFCCC in 1995. The National FCCC Implementation Strategy was prepared in 1996, and the National Environmental Strategy was prepared in 1996. The proposed project coincides with these documents and international commitments.	
8. <i>GEF national operational focal point and date of country endorsement:</i> Indre Venckunaite, Projects and Programmes Management Unit, Ministry of Environment. The project was endorsed on February 6, 2001.	
PROJECT OBJECTIVES AND ACTIVITIES	
9. <i>Project rationale and objectives:</i> (a) Elimination of hydro-fluorocarbons (HFCs) in the manufacture of domestic refrigerators; and, (b) Production of energy efficient home refrigerators without making use of ozone depleting substances.	<i>Indicators:</i> (a) Elimination of the use of HFCs in the manufacture of domestic refrigerators; and, (b) The quantified use of hydrocarbons as cooling agents (iso-butane).
10. <i>Project outcomes:</i> a) Conversion of 9 new refrigerator and freezer models have been specified; b) 9 prototypes have been built, tested and modified; c) Equipment, including safety equipment, will have been purchased and installed; d) Manufacturing and related personnel will have been strengthened. e) Patents, licenses and other necessary documentation will have been acquired; and, f) An amount of tons of CO ₂ equivalent will have been reduced as a result of the production of 8,009,435 refrigerators and freezers over 15 years (on the basis of the GEF contribution alone, the UAC is \$2.56/tC).	<i>Indicators:</i> (a) Specification documents for the 9 new refrigerators and freezers; (b) Nine prototypes are available; (c) Three operational manufacturing lines for refrigerators and freezers; (d) Stable production and delivery of services and/or trained personnel in the warranty shops; (e) Patents, licenses and other documentation; and, (f) New refrigerators in the market.
11. <i>Project activities to achieve outcomes (cost in US\$)*:</i> (a) Specification and procurement of equipment (\$2,289,900) (b) Installation of equipment (\$31,000) (c) Testing, training and certification (\$96,000) (d) Safety audit (\$19,000) (e) Evaluation and transfer of lessons learned (\$33,000) (f) Monitoring and evaluation (\$25,000) * costs include UNOPS fee	<i>Indicators:</i> (a) Specification and procurement documents for new equipment; (b) Installed equipment; (c) Trained personnel operating at the plant; (d) Audit report; (e) Snaige's publicity and UNDP's replication to other refrigeration projects and, an evaluation report; and, (f) Consultancies;
12. <i>Estimated budget (in US\$):</i> PDF A: 0 GEF: 999,900 Co-financing: 1,494,000 TOTAL: 2,493,900	

INFORMATION ON INSTITUTION SUBMITTING PROJECT BRIEF
13. <i>Information on project proposer:</i> The Ministry of Environment of the Republic of Lithuania
14. <i>Information on proposed executing agency (if different from above):</i> UNOPS
15. <i>Date of initial submission of project concept:</i> January 2000
INFORMATION TO BE COMPLETED BY IMPLEMENTING AGENCY:
16. <i>Project identification number:</i>
17. <i>Implementing Agency contact person:</i> Susan Legro, Regional Coordinator for RBEC, UNDP-GEF (susan.legro@undp.org) Jacques Van Engel, Programme Coordinator Montreal Protocol Unit, UNDP-BDP-ESDG (jacques.van.engel@undp.org)
18. <i>Project linkage to Implementing Agency program(s):</i> The project is part of UNDP's efforts in the area of climate change funded by the GEF. The project is linked to other UNDP projects in Lithuania that eliminate ozone depleting substances (ODS). In particular, this project was identified through work conducted under the GEF Montreal Protocol project entitled "Lithuania – Phaseout of Ozone Depleting Substances".

1 PROJECT DESCRIPTION

1.1 PROJECT RATIONALE AND OBJECTIVES

Lithuania ratified the United Nations Framework Convention on Climatic Change on 24 March 1995, prepared its First National Communication in August 1998, and has compiled its inventory of greenhouse gases (GHGs). The objective of this project is to eliminate the use of HFC-134a refrigerant with a CO₂ equivalent of 1300, in the manufacture of domestic refrigerators at Snaige. In particular, HFC 134a will be eliminated by conversion to HC-600a, or iso-butane, systems.

1.2 CURRENT SITUATION

Snaige—situated in Alytus, approximately 120 km from the capital city Vilnius—is the only company in Lithuania that produces domestic and commercial refrigerators and freezers. Founded in 1963, Snaige is presently a private Lithuanian enterprise that exports 82% of its production to 24 countries. Snaige seeks to become stronger in present markets and actively looks for expansion.

Snaige's annual production of domestic refrigerators is about 400,000 units. Of this, 33% are exported to Western European market, 44 % to CEIT countries, and the remaining 23% are sold in Estonia and Latvia. The existing refrigerator designs and technology used at Snaige were developed in-house with assistance from compressor, component, and refrigerant suppliers. Snaige has no formal technical assistance, technology transfer, or licensing agreements with internationally recognized refrigerator manufacturers.

Through the UNDP-GEF Montreal Protocol Project "Lithuania – Phaseout of Ozone Depleting Substances", Snaige converted their foaming lines to use cyclopentane as the blowing agent instead of CFC-11, which is an ozone depleting substance (ODS). The ozone project only provided funding to allow Snaige to convert their foam-blowing operations from the use of CFC 11 to the use of cyclopentane. In order to reduce their use of CFC-12—another ODS—Snaige switched to the refrigerant HFC134a using their own financing. Snaige received no funding from either the GEF or the Multilateral Fund for phasing out the ozone-depleting refrigerant.

The current climate change proposal would assist Snaige to move away from the use of HFC-134a as a refrigerant to the use of iso-butane. This proposal, therefore, has no connection with the previous GEF ozone project which only covered Snaige's "foam-blowing" operations only.

The Lithuanian Government is currently preparing to introduce energy labeling as in the case of the EU. This labeling would be compatible with other internationally agreed labeling such as in the USA, Canada, Japan, and many other countries. Such labeling will extend to other home appliances (e.g., washing machines, cookers, dish washers, dryers, etc.).

1.3 EXPECTED PROJECT OUTCOMES

Snaige now intends to phase out the usage of the materials that contribute to the greenhouse gas effect by the end of the year 2003 in the production of both refrigerators and freezers. However, at present Snaige's products use the refrigerating agent HFC134a – a substance that is not an ODS but has a high Global

Warming Potential (GWP). This project intends to eliminate all HFC consumption in the refrigerator and freezer manufacturing operations at Snaige through the conversion of HFC134a to iso-butane.

Snaige presently uses 60 tons of HFC-134a per year as a refrigerant in the production of domestic refrigerators and freezers. This level of usage has a GHG equivalent of 78,000 tons of CO₂ per year or 1.43 million tons of CO₂ equivalent over a period of 15 years. The details are provided in Annex A on the “Calculation of the reduction of CO₂ equivalents in refrigerator and freezer production”.

Snaige has selected the iso-butane solution to replace HFC-134a as the refrigerant for the domestic refrigerators. Parallel to the elimination of HFC 134a, the introduction of more efficient HC-600a compressors will be used, partially using run capacitors, which allow a further reduction of energy consumption. These energy efficiency modifications will be made by Snaige and are considered to be baseline activities over the lifetime of the project.

Presently the commercially developed options for HFC-134a replacement as the refrigerant in the manufacture of domestic and commercial refrigerators and freezers are limited to iso-butane (HC-600a), Propane (HC-290) and azeotropic mixture of propane and iso-butane (50/50% HC-290/600a). In household refrigerators only iso-butane (HC-600a) is used in practice.

Based on consumer demand, and the state of technological development and required speed to phase out CFC's, CFC-12 was first replaced by HFC-134a. HFC-134a is a largely accepted, well-performing cooling agent, which, due to its high GWP, is seen as an intermediate step in the phase-out process. At the moment, recovery and recycling of refrigerant to reduce emission of GHGs is not realistic for the major market areas of Snaige. Hydrocarbons are the only presently commercialized substitutes for HFC 134a in household and unitary commercial refrigeration and have virtually no GWP.

The majority of European manufacturers of refrigerators and compressors have switched to iso-butane as a replacement for CFC-12 and HFC-134a as the new refrigerant for domestic refrigerators and freezers. More than 75% of European household refrigerator and freezer production capacities are meanwhile converted to iso-butane. There are already more than 35 million completely hydrocarbon-based refrigerators (foam and refrigerant) in the market. Not a single household or servicing accident has been reported. Iso-butane as a refrigerant offers several associated benefits as well (e.g. availability of a wide range of HC-600a compressors, energy optimized and high energy optimized models) and, as a result, lead to HC-600a refrigerators with low energy consumption if properly optimized, and lower noise level.

Overall, conversion to hydrocarbon technology is appropriate given that:

- HC has virtually no impact on the greenhouse effect;
- HC does not affect the ozone layer;
- HC is available;
- HC is a proven technology;
- HC is easy to handle when appropriate equipment is installed;
- HC is cost effective;
- HC-600a model has a lower noise level; and,
- Available wide range of HC-600a compressors, energy optimized and high energy optimized models (variable speed compressors are even much better, but costs at moment double as much as a single speed compressor).

The selected HFC-134a replacement technology is HC-600a, which is a preferred technology from an environmental point of view given that HFCs are greenhouse gases with a high GWP. The choice of HC-600a for this project resulted from discussions with compressor suppliers, and due consideration of the manufacturing scale, refrigerant charge sizes, work-force skills, and product availability. The conversion to iso-butane will take place on a model-by-model basis so that Snaige will have the ability to implement hydrocarbon technology while the user demand for HC-600a and high energy efficient HC-600a models is increasing.

When the project is completed, Snaige will have a manufacturing plant for the annual production of at least 400,000 energy efficient home refrigerators and freezers using hydrocarbon technology as the cooling agent. After 15 years, it is expected that this initiative will have produced the following outcomes:

- 9 new home refrigerators and freezers have been designed, including their refrigeration systems using hydrocarbon technologies;
- 9 prototypes have been built, tested and modified if necessary;
- Equipment required for the manufacturing process will have been purchased and installed;
- Safety equipment required for the manufacturing process will have been purchased and installed;
- The capacity to work with the new manufacturing equipment will have been sufficiently strengthened. Relevant technicians and specialists will have been trained in the various sections of the production line;
- Patents, licenses and other necessary documentation of the new manufacturing equipment and processes will have been acquired;
- ISO standards as applicable in the European Union will be met, in view of the fact that part of the production is for export for that region; and,
- An amount of 390,000 tons of C-equivalent (1.43 million tons of CO₂) will have been reduced as a direct result of the production and sales of 8,009,435 home refrigerators and freezers over 15 years of production (see Annex A).

1.4 ACTIVITIES AND FINANCIAL INPUTS NEEDED TO ENABLE CHANGES

1.4.1 Specification and Procurement of Equipment

Nine models have undergone design modifications for the use of the HC-600a as the refrigerating agent. Tests have been carried out and the Certificates of "TÜV Rheinland" for the safety have been obtained. The production of refrigerators and freezers charged with HC600a for "Quelle" market (Germany) was already begun in September 1999. The further elaboration and fine-tuning of all models for iso-butane technology will be developed mainly "in-house" by Snaige with assistance from UNDP, compressor and refrigerant suppliers. The enterprise does not currently have any formal technology transfer agreements and the necessary technical assistance will be obtained from UNDP's refrigeration technical expert, Snaige's compressor suppliers, as well as the refrigerant supplier. Provision for this is made within the project budget, which will ensure successful project completion.

Models will also be redesigned to reduce energy consumption. Design improvements can be done by a bundle of modifications – depending on the single model, the measured energy saving effect reached by a modification and the involved cost and market conditions of the model. As these activities are considered to provide the baseline for this project, these activities will not be funded through the GEF.

1.4.2 Installation of HC-600a Related Equipment

Modifications on the manufacturing lines are needed in order to convert production facilities to use iso-butane. The equipment supply and the conversion process are to be carried out jointly by a refrigerant charging equipment supplier and Snaige's engineering department. Complete information on the required equipment and installation activities are provided in Annex B. The conversion will include the installation of the following equipment:

- Charging and gas detection equipment;
- Helium charging and recovery;
- Mass spectrometric leak detection;
- Evacuation;
- Safety devices;
- HC-feeding, storage place, and piping; and,
- Ultrasonic welding unit.

1.4.3 Testing, Training, and Certification

This project will involve several testing activities including whether the application of HC-600a in optimized designs leads to an advantage of 2-8% over HFC-134a, say average 5% (this is related to the refrigerant characteristics).

Relevant technicians and specialists will be trained in the various sections of the production line. Necessary patents, licenses and other required documentation of the new manufacturing equipment and processes will be acquired or produced. ISO standards as applicable in the European Union will be met, in view of the fact that part of the production is for export for that region.

1.4.4 Safety Audit

The use of iso-butane technology will require substantial changes to the refrigerant charging and storage and handling facilities because of the highly flammable nature of the substance. The adherence to the accepted safety standards available, such as EN, NFPA, or other internationally recognized standards, are required for UNDP implemented projects, as well as conformance with the statutory safety requirements or recommendations of the Local Authorities. The safety concept that will be used in this projects is as follows:

- Classify all identified hazard areas following IEC 79-10 (second edition, 1986)
- Reclassify or restrict as many areas as possible by the application of engineered solutions such as ventilation, ionizing blowers, static dissipaters, separation walls, etc.;
- Safeguard areas that cannot be reclassified through explosion proofing;
- Provide additional safe guarding through the use of a combustible gas monitoring system with sensors at designated potential emission points and a portable gas detector to be used as part of a formal monitoring plan for areas that do not have continuous monitoring;
- Provide adequate emergency response gear such as fire-fighting equipment;
- Train personnel in safe operating procedures, preventive maintenance, and emergency response. Use formalized procedures through the preparation of a safety manual and an emergency response plan; and,

- Use an external expert or a technology transfer agreement to supervise all designs, the implementation and the start-up. Experienced operating personnel should attend the initial production start-up after conversion.

Under this project the Safety Audit will be required for monitoring the refrigerant charging system's design, manufacture installation and production start-up. In particular the safety audit will ensure that:

- the project will provide Safety Document including all technical, training and legal requirements dealing with industrial safety in line with the best available international industrial practices and local regulations. The aim of the Safety Document is to prevent major accidents which might result from any hazardous industrial activities at the refrigerant charging and in storage and handling of hazardous materials and to limit the consequences of any mishaps for man and the environment;
- all equipment and the complete technological/production process will be designed, manufactured and commissioned according to the requirements of internationally recognized safety institution. Safety Audit will ensure that the selected contractor will set-up a working arrangement with such institution at the early stage of the project and before finalization of start up of the new technology, obtain from the selected safety institution its safety certificate for the converted plant area as a requirement for the completion of the project; and,
- under this project will be organized and implemented on the job training, theoretical and practical training of the plant personnel on operation, on technological safety with regard to storage, handling and use of iso-butane as refrigerant as well as on maintenance of new and/or modified production equipment.

1.4.5 Evaluation and Transfer of Lessons Learned

The methodologies for monitoring and evaluating the achievement of CO₂-equivalent reduction by the new system for home refrigerators and freezer will draw upon the framework established under the International Performance Measurement and Verification Protocol (IPMVP). It is envisaged that an independent and detailed monitoring and evaluation plan to facilitate broader replication will be prepared at the Project Document phase.

The impacts of this project will be monitored by creating a baseline situation and identifying the appropriate methodology for monitoring indicators. This activity is incremental and, therefore, UNDP-GEF is requested to cover this amount.

In order to share the lessons learned from this project to other appliance manufacturers or similar companies within and around Lithuania, a dissemination mission will be conducted twice during the project.

1.5 RISK ASSESSMENT AND SUSTAINABILITY

The following main risks related to the operationalization and sustainable implementation of the activities as well as the proposed implementation arrangements that exist and/or are anticipated:

- Import of low-cost refrigerators that do not make use of HC refrigerants. Snaige is fully aware of this risk, which is mitigated by meeting international standards and being able to export to other countries including those of the European Union;
- Difficulties in the purchase of foreign equipment might delay the assembly and exploitation of the manufacturing line. UNOPS will be requested to actively intervene in the purchase of international equipment as appropriate; and,

- Difficulties in the identification and contracting of foreign companies for technology transfer training and consultancies might interrupt the technology transfer and smooth and timely implementation of the proposed activities. UNOPS will be requested to actively intervene in the identification, selection and contracting of foreign companies as appropriate.

The sustainability of the proposed initiative will be enhanced through:

- The establishment of the manufacturing infrastructure that is associated with capacity strengthening of the design, creation, and operation of the manufacturing line;
- The proposed activities have been initiated by the Government through the Ministry of Environment that is interested in this initiative; and,
- Given that Snaige is the only company producing household refrigeration appliances, there is no internal competition within Lithuania. This project will assist Snaige to meet the local needs while exporting to other countries in the EU and other neighboring countries.

1.6 STAKEHOLDER INVOLVEMENT AND BENEFICIARIES

The Ministry of Environment of Lithuania has initiated the proposed activities. In order to prepare this proposal, they have consulted with UNDP consultants and the GEF operational focal point. A stakeholder meeting was held in Vilnius, Lithuania, at the Ministry of Environment in July 2000. Participants included representatives from Snaige, the GEF Operational Focal Point, and GEF's UNDP representative.

Direct beneficiaries of this initiative will be Snaige, the only enterprise producing refrigerators and freezers in Lithuania, whose existing manufacturing lines will be converted. In addition, the global environment will be an indirect beneficiary of the reduction of GHGs due to the use of HCs with a very low GWP. Furthermore, the use of HC technologies eliminates the use of ozone depleting substances (ODS) and as such has no negative effects on the ozone layer depletion originating from this initiative. The demonstration effect that this crosscutting ODS project has for other countries in the region and beyond is another indirect benefit arising from this initiative.

2 INCREMENTAL COST ASSESSMENT

Under a business-as-usual, or baseline scenario, Snaige will continue to produce refrigerators and freezers using HFC technology. The baseline assumes that Snaige, on its own, will produce increasingly energy efficient appliances over the lifetime of the project. However, under the baseline, there will be no additional technological specifications (e.g., HC technology) produced and no personnel trained to use any other technology. In summary, energy-efficiency measures and the related CO₂-reductions due to more energy-efficient refrigerators (less electricity consumption) were considered to be baseline activities. The proposal as it is presented, therefore, does not take such additional benefits into account, even though Snaige plans to implement such measures on their own. The baseline use of R134a would be 1.2 million kg over a 15 year period, with a CO₂ equivalent of approximately 1.57 million tons. The baseline cost is estimated at US\$1,349,900.

In the project case, the domestic refrigerator and freezer manufacturing line will be based on HC technology. The activities are designed to remove technical and informational barriers that hamper the production of HC-based home refrigerators and freezers. The proposed initiative undertakes all necessary activities related to technology transfer, including hardware and software to set up a manufacturing line for non-HFC home refrigerators and freezers. The results will include the specification and procurement of

equipment, training of personnel, standardisation of the HC technology, and dissemination of experience. Approximately 136,000 tons of CO₂ equivalent will be associated with production under this R134a phase-out scenario, which is estimated at US\$ 2,493,900.

The incremental global benefit of the proposed project stems from the substitution of HFC-technology with HC-technology. The incremental investment costs of US\$ 1,144,000 will lead to the global benefit of reduced GHG emissions equivalent to 1.43 million tonnes of CO₂ equivalent or 390,000 tons of C. The unit abatement cost (UAC), calculated on the basis of the entire incremental cost is estimated at US\$ 2.93/tC. When calculated on the basis of the GEF contribution alone, the UAC comes to \$2.56/tC.

To date, Snaige has converted one third of its production facilities to allow the use of iso-butane. The refrigerant-charging equipment supplier implemented the conversion in collaboration with Snaige's engineering department. The cost of this is included in the project budget. Including Snaige's costs of converting to a more efficient refrigerator design, the total contribution from Snaige (including both the baseline contribution of \$1,349,900 and the incremental contribution to the capital costs of \$144,100) comes to a total of US\$ 1,494,000.

The proposed conversion will include the installation of (see Annex C for details on costs):

- R600a Charging and Gas Detection;
- Helium Charging and Recovery;
- Mass spectrometric leak detection;
- Evacuation;
- Further Safety Devices;
- HC-feeding and storage place and piping;
- Ultrasonic welding unit;
- Ultrasonic welding unit; and,
- Additional related services.

All of the above costs are essential for the conversion. All items will be added to the existing production lines at Snaige and are needed for the conversion process. They are, therefore, considered incremental in nature.

Incremental Cost Matrix

Activity	Baseline (B)	Alternative (A)	Increment (A-B)
Global Environmental Benefits	Refrigerators produced using HFC technology	Refrigerators based on HC technology	Substitution of HFC's; Reduction of 1.43 M tons of CO ₂ -equivalent or 390,000 t of C.
Domestic Benefits	Domestic refrigerator manufacturing line is mainly HFC based.	Domestic refrigerator manufacturing line based on HC.	New up-to-date home refrigerator manufacturing line. Snaige refrigerators become ODS and GHG friendly.
TOTAL PROJECT	US\$ 1,349,900	\$2,493,900	\$1,144,000 Total \$999,900 from GEF \$144,100 from Snaige

3 BUDGET

The requested funding for this project is US\$ 999,900, representing 87.4% of the eligible incremental costs of the GHG elimination project. Snaige's contribution to the project is US\$ 144,100 for capital costs and US\$ 1,349,900 for operational costs.

3.1 BUDGET BY INPUT

	GEF			Snaige	Project Total
	Project	AOS*	Total		
Personnel	125,000	10,000	135,000	-	135,000
Training	23,000	1,840	24,840	-	24,840
Equipment/Subcontracts	733,160	58,655	791,815	1,494,000	2,285,815
Travel	16,000	1,280	17,280	-	17,280
Evaluation missions	18,500	1,480	19,980	-	19,980
Promotional materials	10,170	815	10,985	-	10,985
TOTAL	925,830	74,070	999,900	1,494,000	2,493,900

* UNOPS 8%.

3.2 BUDGET BY ACTIVITY

Activity	Cost (US\$)*
(a) Specification and procurement of equipment	2,289,900
(b) Installation of equipment	31,000
(c) Testing, training and certification	96,000
(d) Safety audit	19,000
(e) Evaluation and transfer of lessons learned	33,000
(f) Monitoring and evaluation	25,000
	2,493,900

* includes UNOPS 8%.

4 IMPLEMENTATION PLAN

4.1 MANAGEMENT

UNDP and the Ministry of Environment will oversee the successful implementation of this project, and will provide technical assistance during the project execution. UNOPS will be the executing agency for this project.

At the outset of the project implementation a project Steering Committee will be set up and will be put in charge of providing adequate monitoring and steering of the activities to be developed. The Terms of Reference for such a steering committee will be prepared during the Project Document Phase. The

Project Steering Committee will be established by GEF Focal Point of the Ministry of Environment from representatives of UNDP, the Ministry of Foreign Affairs, Ministry of Environment and Snaige.

4.2 SCHEDULE

Activities	Project Quarters											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Design and procurement of equipment	X	X										
Installation of equipment			X	X								
Trials, training and certification					X	X	X					
Safety audit								X	X	X	X	X
Information dissemination of lessons learned to other countries						X						X
Monitoring and evaluation						X						X
Project Duration: 36 Months												

5 PUBLIC INVOLVEMENT PLAN

To date, many stakeholder have been involved in the preparation of this proposal, including the Ministry of Environment of Lithuania, Snaige, the GEF Operational Focal Point, consultants, and the GEF's UNDP representative.

The continued involvement of stakeholders will be conducted primarily through Activity 1.4.5 "Evaluation and Transfer of Lessons Learned". To share the lessons learned from this project, to a dissemination mission will be conducted twice during the project to other appliance manufacturers or similar companies within and around Lithuania.

6 MONITORING AND EVALUATION PLAN

The Steering Committee meetings will take place within the first 6 months of the full implementation of the project. The programme manager of the project will draft and submit to each SC meeting a Project Performance Evaluation Report (PPER). If necessary, additional PPERs may be requested during the implementation of project. A final report on the project will be submitted for the consideration of the final review meeting of the Steering Committee. A draft should be submitted at least four months before the final SC meeting. The project will be evaluated by project SC when its implementation is half way through and at the end of the project. All reports shall be submitted to the institutions represented in the Steering Committee under which responsibility is to approve those reports. During the Project Document Phase the Terms of Reference for the evaluations will be prepared.

The project will be annually subject to joint reviews by representatives of the Ministry of Environment on behalf of Government of Lithuania and of the UNDP.

7 ANNEXES

Annex A: Calculation of the reduction of CO₂ equivalents in refrigerator and freezer production
Annex B: Modifications to Manufacturing Lines (details for Activity 1.4.2)
Annex C: Equipment and Project Costs

Annex A: Calculation of the reduction of CO₂ equivalents in refrigerator and freezer production

Year	Refrigerator and freezer production/year ¹	R134a consumption/yr [kg]				Elimination of CO ₂ equivalents in production [ton]	
		Without Project	With Project ²			per year ³	Cumulative
			% HFC-free	Absolute	HFC-Savings		
1	400,000	60,000	30%	42,000	18,000	23,400	23,400
2	416,000	62,400	55%	28,080	34,320	44,616	68,016
3	432,640	64,896	68%	20,767	44,129	57,368	125,384
4	449,946	67,492	80%	13,498	53,993	70,192	195,576
5	467,943	70,192	100%	0	70,192	91,249	286,825
6	486,661	72,999	100%	0	72,999	94,899	381,723
7	506,128	75,919	100%	0	75,919	98,695	480,418
8	526,373	78,956	100%	0	78,956	102,643	583,061
9	547,428	82,114	100%	0	82,114	106,748	689,809
10	569,325	85,399	100%	0	85,399	111,018	800,828
11	592,098	88,815	100%	0	88,815	115,459	916,287
12	615,782	92,367	100%	0	92,367	120,077	1,036,364
13	640,413	96,062	100%	0	96,062	124,881	1,161,245
14	666,029	99,904	100%	0	99,904	129,876	1,291,120
15	692,671	103,901	100%	0	103,901	135,071	1,426,191
Totals	8,009,435	1,201,415		104,345	1,097,070		1,426,191

Total elimination of Carbon (=tonCO₂ *12/44): 390,000 tons

Explanations:

¹ A production increase in the average of 4 % are assumed for the next 15 years.

² The phasing out of HC-134a has already started more than 1 year ago. Further 4 years are necessary to completed phase it out.

³ Elimination of CO₂ equivalents in metric tons. 1kg HFC-134a is equivalent to 1300 kg CO₂ as a Green House Gas.

Annex B – Modifications to Manufacturing Lines (details for Activity 1.4.2)

Following modifications on the manufacturing lines are needed:

- 1. Before assembling the refrigerating system** on the refrigerator cabinet, it is necessary to check the gas-tightness of separate components, normally only
 - evaporator with mounted capillary tube and heat exchanger, and
 - condenser (Snaige uses not plate-on-tube condenser, but produce by welding wires-on-tube condensers, which can cause leaks),as the other components are leak checked by the suppliers. **Snaige has 2 different manufacturing lines for these circuit components** (each 15 sec. cycle time) in different manufacturing halls and need 2 complete leak detection systems for it with higher sensitivity as used in the past because gas tightness is in case of the use of HC safety relevant. Furthermore the pre-control of evaporators has to be carried out before mounting because the evaporators with brazing joints are behind the foodliner and foamed in so that a later leak detection is not possible.
- 2. After assembly and brazing of the cooling circuit** before evacuation and charging the complete system have to be leak checked. Snaige has **3 assembly lines** (each with 45 sec. cycle time).

Gas tightness control of above-mentioned circuit components (point 1) respective of the complete assembled and brazed cooling circuit (point 2) has to be carried out by using an especially penetrative gas - Helium. For this reason the circuit element respective the complete circuit are pre-evacuated and charged with Helium to about 6 bars (Helium charging unit), then tested on gas tightness by using a Helium mass spectrometric leak detector, and afterwards the expensive Helium has to be recovered (Helium recovery station) and cleaned for further use. A complete Helium leak detection system contains of 3 different equipment: the Helium charging unit, the Helium leak detector and the Helium recovery unit. But one Helium recovery unit can recover Helium from 2-3 charged units parallel.

Therefore Snaige need

- for the 2 evaporator/heat exchanger and condenser manufacturing lines 2 Helium charging units and 2 Helium leak detectors and
- for their 3 refrigerator assembly lines further 3 Helium charging units and further 3 Helium leak detectors

In total, 5 Helium charging units (item 5) and 5 Helium leak detectors (item 9) and only 2 Helium recovery units (item 6). Comparing Annex C, List of Equipment, item 9 contains only 4 Helium leak detectors and not 5 as needed; the reason is that one mass spectrometric leak detector (item 8) can be used as Helium leak detector as well as leak detector after charging with HC-600a to control the filling hole closing. For 3 assembly and charging lines 3 of these universal leak detectors (item 9) are needed (see point 7), so the 4th one can be used as Helium leak detector and as the reserve for the 3 final leak tests after charging on 3 lines to ensure continuous production in case one fails. The leak detectors have to be regularly calibrated with Helium calibrated test leaks (item 11).

These equipment is just sufficient for the above-mentioned cycle time. By increasing the capacity on existing lines (=reduction of cycle time) additional evacuation pumps to fasten up the evacuation before Helium charging and further evacuation pumps before refrigerant charging are needed, all not foreseen in this project.

The 3 Helium charging units on the assembly lines in addition have a second gun with dosing unit to charge Nitrogen with minimum 13 bar as pressure test required according to IEC/EN 600335-2-24 section 22.28. while the units on the evaporator are checking if the capillary tube is blocked.

It is strongly recommended to purchase condensers instead of manufacturing it at Snaige to improve quality and to use the foreseen helium leak detection system as reserve for the 3 assembly line and the evaporator line to ensure continuous running. It is necessary to have the reserve charging and leak detection in order to carry out calibrations and maintenance on the equipment.

3. Since the R600a technology is more critical than the HFC 134a technology for the non-condensable gases, it is necessary to carry out an initial evacuation (few minutes) and running of the compressor for further few minutes prior the ordinary evacuation process. For this **reason 5 additional pumps per line totally 15 additional pumps** are needed (item 15) and the carousels must be prolonged by this positions (item 17). By means of this the non-condensable gases are released from compressor oil. The pumps have to be controlled regularly by a Pirani (item 16). Alternatively a flushing with HC-600a can be executed, but this required safety precautions, not foreseen in this project. And then proceed with the ordinary evacuation process as done in the past for HFC-134a. With the exception of this very non-condensable gas for HC-600a circuits the other cleanliness requirements are similar to the ones of HFC-134a due to the much lower charging quantity of HC-600a in comparison to HC-134a.
4. With a special designed **HC-charging board** (item 1) **on each of the 3 assembly lines** of Snaige which get the refrigerant by feeding station with pumps (items 26-27) the evacuated refrigerators are charged with the preset dose of HC-600a. Before HC-charging the charging board makes a series of test, if the gun and dosing system is tight, the refrigerator is not already charged before, the refrigerator and gun connection to refrigerator is tight, charging station parameters and preset values are inside tolerances. If the test results are positive, the board charges the dose of HC-600a refrigerating agent automatically and remove the gun from the refrigerator. The HC-board gun is heavy and needs a rail with balancer (item 3). To run these lines safely a bundle of safety devices are needed, which are on each line
 - **a gas detection system with 3 gas sensors** to control the charging board and the charging area (item 2),
 - 4 spring loaded **self closing valves** (item 19), one on each end of the HC-feeding lines near each of the 3 charging boards and one on the feeding place near the pumps, to close the pipes in case of alarm and during work stops,
 - one **solenoid valve** (item 20) to stop the pneumatic feeding pump in case of alarm,
 - 8 overpressure **safety valves** (item 21), one in each pipe section which can be closed,
 - a **ventilation system** to remove gas in the charging board, near the charging gun and one HC-feeding joints which are not technically tight,
 - the above-mentioned **gas warning alarm board must be extended** (item 22) to switch on and off the power of the charging board (and other equipment inside the hazard zone, to control the ventilation system, to add 2 manual Iso-butane hazard switches in case of fire or else, and
 - the **charging boards must be enclosed with 4 walls** and 2 self closing doors (item 24) with a volume of about 18 m³.
 - 4 **Fire extinguishers**, 4 smoke detectors, a set of warning plates, escape way markings, instruction boards are needed (item 25),

5. An **out-door feeding and storage area** with HC-bottle storage, switch-over system (item 26), a must for the produced quantities and required cycle times, and **2 feeding pumps** (item 27) for HC have to be made and connected by a ASTM A333 Grade 6 or TTST35N **pipeline** resistant against low temperature (item 28) of about 150m to all 3 HC-charging lines, and further piping (item 29) is are needed (Nitrogen, compressed air, cable protection pipes). A filter dryer to remove water inside compressed air has to be added to allow out-door feeding by using a pneumatic pump.
6. To close the filling tube of the Hydrocarbon charged refrigerators an **Ultrasonic welding machine on each of the 3 lines** is needed (item 30).
7. Finally it is necessary to check the gas-tightness of ultrasound welded filling tubes using a **mass spectrometric leak detectors** (item 9) **on each of the 3 lines**. This leak detectors are not disturbed by other gases like Cyclopentane, which may escape from polyurethane foam or else. Therefore, mass spectrometry selective detectors are required.
8. On repair lines of HC-charged refrigerators normal vacuum pumps are not allowed to be used. Therefore **3 ex-proof vacuum pumps**, each with 2 flame resistors according to established safety standards are required (item 19).

Annex C – Equipment and Project Costs

Item	Description	Quantity	Unit Price	Sub-total *US\$)	Totals (US\$)
R600a Charging and Gas Detection					
	1 R600a Charging board with 2 guns/dosing	3	70,000	210,000	
	2 Gas Detection System 3 Gas sensors	3	13,500	40,500	
	3 Rail with balancer	6	1,100	6,600	
	4 Spare Part Kit	3	2,000	6,000	
				263,100	
Helium Charging and Recovery					
	5 Helium and Nitrogen Charger Board	5	17,000	85,000	
	6 Helium Recovery Board	2	17,000	34,000	
	7 Spare part kit	5	2,000	10,000	
				129,000	
Mass spectrometric leak detection					
	8 Mass spectrometric Sniffer Leak Detector	4	23,500	94,000	
	9 Helium Sniffer Leak Detector	4	16,000	64,000	
	10 Calibrated test leak for R600a	1	2,000	2,000	
	11 Calibrated test leak for Helium	1	2,000	2,000	
	12 Sniffer Line and probe, SL303, 3m	10	950	9,500	
	13 Spare parts	8	1,000	8,000	
	14 Turntable for controlling leak on both sides of refrigerator	3	1,000	3,000	
				182,500	
Evacuation					
	15 2-stag.rot.Vacuum Pumps 18m³/h, anti suck, 2 hose+B12,gas ballast	15	2,800	42,000	
	16 Pirani instrument for vacuum pump maintenance	1	600	600	
	17 Pump carousel without vacuum pumps for pump quantity	15	1,200	18,000	
	18 Repair line Ex-proof vacuum pump with flame resistors	3	5,200	15,600	
				76,200	
Further Safety Devices					
	19 Self closing valve groups in R600a feeding line	4	850	3,400	
	20 Closing valve for feeding pump	1	150	150	
	21 Safety valves in R600a feeding line	8	150	1,200	
	22 Alarm Board Extension to control electrical supply to R600a charging area, Emergency switch off, Ventilation control	3	1,400	4,200	
	23 Ventilation system with ventilators, ducts, control	3	5,500	16,500	
	24 Side panel enclosure, steel supports (locally) set	3	2,100	6,300	
	25 Fire extinguishers, smoke detectors, warning signs, escape way markings	1 set	2,000	2,000	
				33,750	
HC-feeding and storage place and piping					
	26 HC-feeding and storage place with Switch over system	1	15,000	15,000	
	27 Refrigerant Feeding Pump RP2	2	6,500	13,000	
	28 Refrigerant pipeline with support etc per m	150	90	13,500	

29 Pipes for compr., Nitrogen, cable protection, cables per m	150	30	4,500	
			46,000	
30 Ultrasonic welding unit	3	30,000	90,000	
Totals of ex work equipment in US\$				820,550
31 Packing, Transportation, insurance	1	36,710	36,710	
32 Installation supervision, start up and Training	50	500	25,000	
			61,710	
Equipment CIF Alytus, installation, start up and training total in US\$				882,260
SERVICES				
33 Re-design, prototyping, testing, pilot scale production etc. for each different model	9	10,000	90,000	
34 Safety auditing	1	15,000	15,000	
35 Technical advisory service	1	30,000	30,000	
36 M & E Consultant			22,500	
37 Promotional materials for dissemination workshop			10,170	
			167,670	
Capital costs to phase out HFC-134a				1,049,930
37 Contingencies			20,000	
38 Subtotal			1,069,930	
Snaige's Contribution for Capital Costs (US\$)				144,100
GEF Contribution (without AOS)				925,830
AOS				74,070
TOTAL INCREMENTAL CAPITAL COST (US\$)				1,069,930
TOTAL GEF CONTRIBUTION (US\$)				999,900

Project checklist

PROJECT ACTIVITY CATEGORIES			
Biodiversity	Climate Change	International Waters	Ozone Depletion
Prot. Area zoning/mgmt:	Efficient prod. & distribution:	Water body	Monitoring
Buffer zone devpt:	Efficient consumption: X	Integrated land & water:	Country programme:
Inventory/monitoring:	Solar:	Contaminant:	ODS phaseout: X
Ecotourism:	Biomass:	Other:	Production: X
Agro-biodiversity:	Wind:		Other:
Trust fund(s):	Hydro:		
Benefit-sharing:	Geothermal:		
Other:	Fuel cells:		
	Other:		
TECHNICAL CATEGORIES:			
Institution building:			
Investments:			
Policy advice:			
Targeted research:			
Technical/management advice: X			
Technology transfer: X			
Awareness/information/training: X			
Other:			



LIETUVOS RESPUBLIKOS
APLINKOS MINISTERIJA

ENTERED
MAR 06 2001

2001 02 06

Nr. 05-04-668

To: Mr. Mohamed T. El- Ashry
GEF, Chief executive officer and chairman
GEF Secretariat, 1818 H Street NW
Washington DC, 20433, U.S.A

Re: UNDP/GEF - Elimination of Green House Gases in the manufacture at Snaige Company and use of HFC-free, energy efficient domestic refrigerators and freezers – Letter of Endorsement

Dear Mr. El- Ashry,


The Ministry of Environment of Lithuania is pleased to support the proposed UNDP GEF *Elimination of Green House Gases in the manufacture of domestic refrigerators and freezers and in the use of high energy efficient refrigerators and freezers in Snaige company* Project Brief.

This project will contribute to realisation of United Nations Framework Convention on Climate Change, ratified by Lithuania in 1995 and commitments under the Kyoto Protocol, signed in 1998. Lithuania is making great efforts to compile a National Inventory of Green House Effect Gases, to eliminate Green House Effect Gases and to control energy consumption to eliminate losses. The following objectives will be achieved with the proposed project towards the implementation of UNFCCC requirements: HFC's in the manufacture of domestic refrigerators will be eliminated, energy efficient home refrigerators without making use of ozone depleting substances produced, CO₂ emissions related to energy needs of domestic refrigerators reduced.

We consider great importance the realisation of the project's objectives. It is also important that Snaige Company has already give their financial commitment to co-finance the project as estimated in project document.

Given the above, the Ministry of Environment kindly asks GEF Secretariat to endorse this project.

Yours sincerely,


Henrikas Žukauskas
Minister

Annex: Project Brief "Elimination of Green House Gases in the manufacture at Snaige and use of HFC-free, energy efficient domestic refrigerators and freezers".

Cc: Ms. Cihan Sultanoglu - Resident Representative of the UNDP in Lithuania

Endorsed by GEF Focal Point:
Ms. Indrė Venckūnaitė

A. Jakšto 4/9.
LT-2694 Vilnius
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