UNITED NATIONS

EP

United Nations Environment Programme

Distr.
GENERAL

UNEP/OzL.Pro/ExCom/62/Inf.4
23 November 2010

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixty-second Meeting
Montreal, 29 November - 3 December 2010

UNIDO PROJECT CONCEPT ON ODS DESTRUCTION IN ARTICLE 5 COUNTRIES

1. UNIDO had submitted for the consideration of the 62nd Meeting a project proposal for an ODS destruction pilot project in Mexico. After initial review of the proposal, the Secretariat noted that the project did not meet the requirements of decision 58/19, interim guidelines for the funding of demonstration projects for the disposal of ODS, and therefore requested that this be withdrawn and submitted to a future meeting in line with the decision. Based on discussions with the implementing agency the Secretariat agreed that, in order for the project concept to be placed before the Executive Committee, UNIDO would prepare an information note to the 62nd Meeting.

2. In view of this, the Secretariat received an official communication from UNIDO requesting the inclusion of a paper on a concept and approach for the implementation of ODS pilot projects in Article 5 countries, and seeking guidance from the Executive Committee on a way forward.

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO PROJECT CONCEPT ON ODS DESTRUCTION IN ARTICLE 5 COUNTRIES

Prepared by
Montreal Protocol Branch

November 2010
Vienna

1. PREFACE

UNIDO has developed a demonstration project concept which is intended to be in accordance with the guidelines approved at the 58th ExCom meeting, and to finally allow action to be taken on this long-standing and growing problem.

The objective of this paper is to describe the project from collection to disposal, in a way that shows how "seed money" from the MLF can be used within a country to take the banked ODS and destroy it so that it becomes part of a carbon trading programme, which will generate income to those who participate. Thus, the demonstration project will show how this financial mechanism can be used as an incentive to enterprises in A5 countries, such as India, China, Brazil, and Mexico, to participate in carbon trading programmes for profit or for lower cost destruction.

According to a 2002 report issued by the Intergovernmental Panel on Climate Change (IPCC) with The Technology and Economic Assessment Panel (TEAP) the banks of CFCs represent 20 billion tonnes (Gt) of CO_2 equivalent (CO_2 -eq). They suggest that nearly 6 Gt of CO_2 -eq will be released into the atmosphere from 2011 to 2015 and further estimates that by 2015, 2.3 Gt of CO_2 -eq will be released per year. This would more than offset the benefit of reducing Greenhouse Gas (GHG) emission achieved under the Kyoto Protocol.[1]

The Parties to the Montreal Protocol have requested as a matter of urgency the Executive Committee of the Multilateral Fund to look into ways and means to eliminate unwanted ODS available for cost effective collection. In late 2006, an experts' report revealed that several sectors across a number of countries had accumulated and would continue to accumulate ODS, that was made available for "ODS Banks". These chemicals should be destroyed before they are emitted into the atmosphere, thereby preventing them from reaching the ozone layer. The destruction of these chemicals would also provide other environmental benefits as described in this document.

UNIDO's project concept for the formulation of ODS destruction projects in Article 5 countries will be submitted to the 62nd ExCom for consideration and final decision on its eligibility. It is expected that if positively considered by the ExCom, a demonstration project for disposal of unwanted ODS in Mexico, will be submitted to the 63rd meeting of the ExCom. This demonstration project could serve as a model for similar projects under preparation in Algeria, China, Nigeria and Lebanon.

While the Montreal Protocol has been very effective in reducing the production and consumption of ozone-depleting substances it does not control emissions from ODS banks or require the elimination of ozone-depleting substance banks. In the absence of legislation, or other incentives requiring or encouraging the capture or destruction of the substances contained in these banks, a high risk of gases leaking into the atmosphere is to be considered with dramatic consequences for the ozone layer and climate.

[1] Recovery and Destruction of ODS Banks, Environmental Investigation Agency, July 2009

According to the Report by the Secretariat on funding opportunities for the management and destruction of banks of ozone-depleting substances (UNEP/OzL.Pro/Worshop.3/2/ Add.1) with regard to ODS emissions reduction from the banks the Parties to the Montreal Protocol adopted decision XX/7, initiating action in three areas. Firstly, they called for further study on the size and scope of existing ozone-depleting substance banks and the costs and benefits of taking action on different categories of banks in relation to the ozone layer and climate change. Secondly, they called upon the Multilateral Fund to initiate pilot projects with a view to developing practical data and experience, achieving climate benefits and exploring opportunities to leverage co-financing. Thirdly, they called for the identification of funding opportunities for the management and destruction of ozone-depleting substance banks.

ODS disposal was recognized as being an important issue for Article 5 countries lacking the necessary facilities to collect CFCs and destroy CFC stocks. Networks in Article 5 countries dealing with the recovery and recycling of CFCs from the banks, having the necessary equipment for CFC extraction and shredding operations and consequently with final CFC destruction at cement kilns or waste incineration plants need to be established.

2. UNIDO PROJECT

UNIDO submitted the Demonstration ODS Destruction Project for Mexico to the 60th 61st and 62nd ExCom meetings. This project will cover the disposal of 119.7 ODP tonnes of CFC-12 in the refrigeration and air-conditioning sector in Mexico by the end of 2012 (Phase A) due to the efforts of the Government of Mexico under the WB project, which promoted the use of more efficient appliances through the introduction and enforcement of minimum energy performance standards with a rebate scheme for higher efficient appliances combined with old refrigerator turn-ins for scrapping.

The UNIDO project also covers further disposal of 900 ODP tonnes of CFC-12 and CFC-11 during the second project phase of an additional 10 years (Phase B), which is financed by the Carbon Trading Offset Programme (CAR and VCS). The Project proposal incorporates the recovery of CFCs from end-of-life refrigerators and air conditioners (CFC-12 from the compressor circuit) to be collected in Mexico by using de-manufacturing facilities, which will be partially provided by the project budget (Step I machinery – CFC-12 recovery unit –three pieces-US$ 1.0 million) and further the project to be funded from Carbon Trading Credits Scheme (Step II machinery - one shredding plant with a CFC-11 recovery unit- US$ 4.0 million). The already recovered CFC-12 (119 MT) will be destroyed in the USA (an incineration plant will be identified) under the Carbon Action Reserve (CAR) and CFC-11 in Colima Cement Kiln in Mexico and/or in Plasma Arc Incinerator in the city of Monterrey, Mexico, under the Voluntary Carbon Trading Programme. The incremental operating cost (IOCs) will cover two year's expenses associated with transportation and incineration costs of CFC-12 to/in the USA.

The project proposal was prepared bearing in mind the Report by the Secretariat on Funding Opportunities for the Management and Destruction of Banks of Ozone –

Depleting Substances (UNEP/Ozl.Pro/Worshop.3/2Add.1), linking the project activities with carbon trading credits. This demonstration project incorporates the two parts: the first two years: Phase A, supported by the MLF, to establish project destruction facilities and provide project de-manufacturing equipment, followed by an additional 10 year Carbon Trading Offset Programme - Phase B, which deals with the destruction of a larger quantity of CFCs available in the refrigeration sector in Mexico.

Overall, the intension of UNIDO was to develop and propose a strategy, and project, for the final destruction of ODS in countries where sufficient quantities were available to cost effectively secure them, and then destroy them in an environmentally sound manner. There were options to be evaluated so that destruction could take place in an economical way. This involved technical and cost analysis of destruction technologies and their availability, plus logistical studies as well.

Since there was apparently little time to review the project proposal, UNIDO was twice requested to re-submit it at subsequent meetings. Although not all elements of the project are financed by the MLF, a description of all activities around the project has been provided, including components not eligible under the MLF. This ensures that the project will have full control of all operations until final destruction, while funding only eligible ones according to the MLF guidelines.

3. PROJECT OBJECTIVES

The objectives of this project in Mexico are:

a) To establish a new process and facility for de-manufacturing end-of-life refrigerators as well as for the destruction of recovered CFCs by the project;
b) To modify/improve local legislation with regard to the ban on CFCs emissions and initiate a producer/distributor responsibility programme to assist in collecting ODS contained in electrical appliances in Mexico;
c) To establish a 10 year carbon trading offset programme following the project's financing for two years, which makes it possible to run the project in a sustainable manner. This would allow additional large quantities of banked ODS to be destroyed over the next ten years in Mexico.

This project strategy describes in general terms the work programme that needs to be implemented. UNIDO intends to identify those sectors, locations, and ODSs that can be gathered and destroyed in a cost-effective manner. It will also describe the work needed to identify the policies, technologies, logistics and systems needed, and the projected costs to do so. UNIDO will also have to analyze the information and reports already available on CFC quantities used in the RAC (all sectors, such as MAC and servicing, the most promising sector) available in Mexico and the measures in place to establish inventories, including recycling, recovery and reclaim. Finally UNIDO will determine if and where there are CFCs from these activities, which have contaminated material that

needs to be disposed of and determine if there are accumulating inventories, in which ongoing programmes of recycling and recovery are expected to continue, and therefore need to be disposed of to prevent problematic accumulation in Mexico.

Once the above data has been gathered, UNIDO will develop a plan to earmark those CFCs that should be destroyed, and the technologies, methods, strategy, and programmes to accomplish such destruction in Mexico. UNIDO will review costs and timing and prepare a recommended destruction programme, including anticipated changes in the future, in order to destroy the CFCs in a cost- effective and timely manner and prepare the basic outline of a sub-project with a detailed work plan and costs.

We strongly believe that this project proposal is a real opportunity to demonstrate to Article 5 countries through the concept outlined below that ODS destruction could be self-sustained and moreover self-financed through the carbon trading credits.

However, it was our understanding that the comments from the MLF Secretariat requesting to narrow down the scope of the project (to deal only with 119 MT of CFC-12 collected over the past years under the WB/Government project) to cover only Phase A of the project proposal. The MLF Secretariat was reluctant to accept the project concept proposed by UNIDO referring to the above-mentioned guidelines, which consider the collection of ODS in Article 5 countries as ineligible. However, the task is not how to get rid of the collected amount of CFCs but rather suggest a methodology and ways and means to tackle the issue of destroying unwanted ODS without a heavy financial contribution from the MLF, as requested by the MOP.

A request for consideration of the project, taking these elements into consideration, can be made referring to the fact that this is a DEMONSTRATION project to secure a pathway for something for which no action was taken for the past 10 years. If this approach proves to be viable, various payment mechanisms for transportation, de-manufacturing etc. can be debated and even the guidelines could be reviewed based on the new knowledge gained from the demonstration project.

Indeed TEAP has drawn the attention of the international community to deal with the so-called ODS banks, which, if neglected could offset the benefits of ODS phase-out. Therefore, UNIDO strongly believes that the issue is not a discussion on the eligibility of some project items or which amounts should be considered as eligible, but rather on a long standing solution for ODS destruction in Article 5 countries, where so far, there are no collection networks established. UNIDO's project proposal is a good way forward identifying an innovative way of co-financing beyond any contribution from the MLF. We also strongly believe that the approach suggested could serve as a good example for other Article 5 Countries, since this is the main objective of a demonstration project.

In agreement with the MLF Secretariat, as an intermediate solution, this report has been prepared for the consideration of the 62nd ExCom meeting with the hope that the proposed project concept will be given a chance of being reviewed by the ExCom for the

merits outlined above and that the ODS destruction project for Mexico would be further recommended for consideration at the 63rd ExCom Meeting.

4. GUIDELINES FOR SELECTION OF ODS DISPOSAL PROJECTS

In decision 57/6 the Executive Committee requested the Secretariat to prepare a document containing criteria and guidelines for the selection of ODS disposal projects for the consideration of the Executive Committee at its 58th Meeting, taking into account decision XX/7 of the Twentieth Meeting of the Parties, and the contact group discussions on ODS disposal project selection held at the 57th Meeting.

According to the Guidelines approved by the 58th ExCom **no funding** will be available for demonstration projects for the collection of ODS, except as a contribution to the monitoring of an already existing collection scheme, funded separately, and only if the existing project also includes components related to transport. This means that the guidelines cover only the actual cost of destruction of already available amounts of ODS in Article 5 countries.

The guidelines do not mention whether such ODS collection networks already exist in Article 5 countries. However, in reality, as known in the case of Mexico the country had initiated an energy efficiency programme by replacing old refrigerators with new ODS-free ones. The project objective was also the development of used electrical appliances collection and disposal facilities. This programme gave a chance of collecting old refrigerators at least fully loaded with CFC-12 as a cooling agent. There are no such programmes initiated in other Article 5 countries (except in Brazil and Ghana). This means that only one or two countries in the world can meet the requirements of the MP guidelines for ODS destruction projects, i.e. the availability of CFC-12 already collected. Taking into consideration the project concept proposed by UNIDO these requirements can at least be met in Mexico but not in other Article 5 countries.

5. THE CLIMATE BENEFIT COMPONENT

The numerous calls from Article 5 countries for assistance to manage their unwanted ODSs, which are accumulating in equipment, ports, reclamation centers, etc., have caused the IAs to consider innovative approaches to financing under the climate change regime. Voluntary carbon markets provide an opportunity of generating financing for ODS destruction as they are not bound to compliance markets and because ODS, that can have extremely high GWPs, would be an attractive source of emission reduction credits. To date, three markets issue credits for ODS destruction: the Chicago Climate Exchange (CCX); the Voluntary Carbon Standard 2007 (VCS); and Carbon Action Reserve (CAR). These markets are not necessarily restricted to the six (6) Kyoto gases and therefore could potentially become markets for destruction of unwanted ODS, if a methodology was proposed and approved.

The project will include quantification of the greenhouse gas (GHG) reductions in carbon dioxide equivalents, associated with destruction of ODS. A methodology conforming to a

recognized standard, e.g. International Standards Organization, should be used for the quantification as well as the tracking of materials from the point of origin to destruction, and should provide a monitoring plan that can be used for project verification. The methodology would ideally allow for the project GHG reductions to be eligible for carbon credits for issuance by a recognized carbon registry, e.g. Climate Action Reserve. CFC-12 as refrigerant and CFC-11 as foam blowing agent in end-of-life appliances could be recovered in the same project activity.

6. NETWORK OF SCRAPPING COMPANIES IN MEXICO

Since 2007, 98 centers from the FIDE programme (energy save) have become operational in Mexico in domestic refrigerators/ACs sector dealing with substitution of old refrigerators and their dismantling. SEMARNAT and UNIDO, through the NPP, has provided training and recovery equipment for refrigerants recovery from old appliances that were dismantled in these centers. Due to these activities in Mexico some quantities of surplus refrigerants gases have been stored at the premises of scrapping companies, mainly mixtures of CFC-12 and HFC-134a from old refrigerators contaminated with water, acids or oily HCFC-22 gas. These quantities need to be destroyed.

The Mexican Government, through the Secretariat for Energy, has established another very ambitious programme of further substituting domestic refrigerators and air conditioners with the goal of 1,600,000 pieces to be collected from 2009 to 2012. The 98 scrapping centers will also be involved in fulfilling this task by collecting CFC-12 from the compressor circuits only. This new stage began in January 2009 and represents the main source of surplus gas refrigerants and insulations foams for the UNIDO project. The UNIDO project has to strengthen the network of scrapping companies and develop a mechanism of funding the CFC collection efforts under a Carbon Trading Scheme applied in the project. In order to have such a network of scrapping companies function properly the majority of these companies need to be equipped with CFC-12 recovery units and storage tanks. Furthermore, transport cylinders are needed to transport the extracted CFC-12 to the place of destruction. These companies are not in a position to extract CFC-11 from insulation panels since additional equipment such as extracting and shredding devices will be needed, which according to the project proposal can only be purchased after CFC-12 are credited against the CO_2 emission reduction scheme under the carbon trading programme and which will be sold later in order to gain project funds to buy such devices.

However, the scrapping process in Mexico has a lot of disadvantages. The cooling circuits are emptied into a container in a way, which only makes it possible to collect the evaporated part of CFC-12. A large part (an estimated 40 per cent) remains dissolved in lubricating oil, which emits into the air within a short period of time. In a modern de-manufacturing unit this problem is solved by heating the lubricating oil and distilling out the 98 per cent of CFC-12. Therefore, the project applies a new de-manufacturing technique, the cost of one de-manufacturing unit (24 pcs/h) to extract CFC-12 being about US$ 300,000.

7. UNIDO PROJECT CONCEPT ON ODS DESTRUCTION

The concept of this project is based on four independent outcomes and project activities that the MLF guidelines do not support:

a) To formulate new legislation/guidelines in the country and necessary incentives concerning
   - the ban on ODS emissions and ODS-containing appliances disposal in landfills;
   - the collection of end-of- life refrigerators and ACs in some established places for their further destruction by the new project facilities, and
   - the introduction of a Producer/Distributor Responsibility Programme in Mexico.;

b) To strengthen the established network for collection of electrical appliances containing ODSs (refrigerators and ACs) in Mexico in order to extract CFC-12 from the compressor circuit and CFC-11 from the polyurethane foam panels of refrigerators and transport them to the incineration place selected;

c) To introduce the most updated technologies for CFC-12/CFC-11 extraction (maximum possible quantity of gases extracted) from end-of-life refrigerators and air-conditioners and their destruction in a sustainable manner. This part is expected to be supported by MLF as **Phase A**; and

d) To apply a Voluntary Carbon Trading Offset Programme with the purpose of further mobilizing project funds for monetary support of CFC-12 (compressor circuit) and CFC-11 (refrigeration insulation foams) collection and destruction over 10 subsequent years as **Phase B** without MLF financing and ODS destruction could be self-sustained and moreover self-financed through the carbon trading credits. Additional income is to be generated by selling Carbon Trading Credits in order to purchase additional equipment needed by the project to start the shredding of CFC-11- isolating PU foam panels (the cost of a shredding plant is about US$ 4.0 million).

The project in Mexico proposed to recover CFC-12 and CFC-11 from electrical appliances using a two-step approach:

a) In Step I, the CFC-12 refrigerant, together with the refrigeration oil, are removed from the refrigeration cycle; oil is treated to remove the CFC-12 in order to increase the efficiency of the CFC-12 recovery; and
b) In Step II, the refrigerator without CFC12 and oil is placed into a shredder and after the shredding operation, the shredded materials are sorted and the polyurethane foam insulation panels of the refrigerator are finely grounded. This destroys the cell structure of the foam and releases a significant portion of the CFC-11 within the cells.

The ExCom approved in its Decision 58/19 the guidelines for the funding of demonstration projects for the disposal of ODS in accordance with Decision XX/7 of the

Meeting of the Parties. According to these guidelines no funding would be available for the collection of ODS. Therefore, the previous collection efforts of the network of 98 scrapping companies in Mexico, resulting in the collection of 119 MT, could be considered as a starting point, with no money needed for collection**.** Some additional project activities like CFC extraction equipment, strengthening of the R&R network in Mexico for CFC collection, storage and transportation to incineration places, and the improvement of a domestic legislation are considered by the MLF Secretariat as ineligible and are, therefore, not included. This is the main reason why the ODS destruction project in Mexico primarily designed by UNIDO to cover all the ODS banks, where CFC is available (commercial and industrial refrigeration, MACs, servicing sector, etc.) finally concentrated only on end-of-life refrigerators and ACs.

7.1. Changing the Regulatory Background in Mexico

The implementation of the Demonstration Project will need to be closely aligned and coordinated with the various policy, regulatory, fiscal, awareness and capacity-building actions that the Government of Mexico is taking to ensure that the implementation of the project is consistent with its priorities. The project needs clear commitment from the government in bringing a ban on ODS emissions and establishing the change of regulation needed to require car owners to change the refrigerants in their air conditioners to new, non-ODS, low GWP refrigerants. The most important regulation, which should be in place and known to every player who works with ODSs in Mexico, should be the general ban on the venting of ODSs, not only for refrigerators and air conditioners in general, but also for fire fighting facilities. It is planned that this ban will be introduced in Mexico within one year from the beginning of the project implementation.

The steps set out below are necessary in order to establish and maintain an effective system for processing CFC-containing waste household appliances in Mexico. Regulation (EC) - 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer should be taken into account while preparing a new domestic legislation. If a legislation already exists, systematic implementation and compliance monitoring is essential. If an equivalent or similar legislation is already in force in Mexico, it is very important to monitor proper compliance with these laws.

This requires:

a) A Ban on dumping CFCs in landfill sites
If Mexico has an act or regulation similar to the European Union's Landfill Directive (Council Directive 99/31/EC of 26 April 1999 on the landfill of waste) any bans on the deposition of CFC-containing products could be made mandatory by inclusion in the act or regulation. Compliance with this new provision should be monitored strictly;

b) Defining and assigning the responsibility for financing recycling programmes
The financial responsibility for recycling can be assigned in three possible ways:
- The financial responsibility is borne by local authorities (this was the situation in Europe until 2006)

- Power utility companies fund recycling (this is the voluntary scheme currently in use in Mexico)
- The financial responsibility for waste collection and treatment lies with the manufacturers of the appliances (this system has been in use in Europe since 2006, see WEEE Directive). Whether a legislative instrument is used will solely depend on whether and to what extent carbon credits (carbon offset certificates) can be generated;

c) Establishing rules for waste treatment procedures
To ensure that the recycling technology used actually recovers at least 90 per cent of the CFC contained in the waste appliances and that the CFC recovered is safely and completely destroyed, it is absolutely essential to set binding rules to govern the operation of refrigerators recycling facilities and to set mandatory CFC recovery levels.

The Producer Responsibility Programme is also considered as the most important element of the ODS destruction project in Mexico. UNIDO defines these initiatives as Producer Responsibility Programs (PPR)/Extended Producer Responsibility (EPR)/ Product Stewardship Programmes (PSP) as an environmental policy approach, in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle. Bearing in mind the ODS destruction programme PPRs deal with post-life of refrigeration and air-conditioning equipment and the proponents for introduction of such a programme in Mexico will be discussed with the government at the very beginning of the project implementation.

7.2. Investment Component

The investment component of the project will focus on the fact that the project is only for demonstration but will keep open the possibility to continue the activities, which have proved to be effective and economical. The incineration is assumed in a cement kiln in the USA or in Mexico. The advantage of a cement kiln high investment costs are not needed to adopt the facility to burn CFCs. Therefore, this component of the project proposal does not play any significant role.

7.2.1 Designing a Recovery & Recycling System for ODS Collection

All the scrapping companies in Mexico under this project are considered as R&R companies; some of them are involved in recovery operations only and some can make CFC-12 recycling before shipment to the USA. The project beneficiary is considered as a centralised facility, which would be equipped with project recovery, recycling and storage equipment and be responsible for the CFC-12 collection from the scrapping companies and its transportation to the centralised facility storage. The description of the centralized R&R network is given in the project document. The necessary special equipment, i.e. recovery units, storage tanks, pumps, transportation cylinders, etc. will not be provided to all scrapping companies but only to some of them taking into account that all of them have an incentive to sell CFC-12 as per the project document (US$ 4.0 per kg of CFC-12) to the centralized R&R facility and will be interested in purchasing this equipment.

7.2.2 De-manufacturing of end-of-life Refrigerators

De-manufacturing technology aims at recovering CFCs, VOCs, other refrigerants and blowing agents, harmful substances and any components containing harmful substances, and to retrieve and separate recyclable materials, and involves breaking-up (i.e. shredding, crushing, milling), sorting and classification of the materials obtained in Step I and Step II and the preparative steps needed before recycling or disposing of these materials.

Specification parameters for the facility to be advised by the Project Beneficiary:

- Annual capacity: 200 000 pcs of domestic refrigerators in one shift;

- Recycling efficiency: min. 90 per cent meaning that min. 90 per cent in weight of the original end-of-life refrigerator is separated in the form of materials, which can be sold;

- The efficiency of recovery of CFCs from cooling circuits and from the insulation foam should be higher than 90 per cent by weight;

- The components of end-of-life refrigerators, which are considered as hazardous waste (e.g. mercury switch, capacitors, etc.) can be collected separately. These hazardous components of end-of-life refrigerators must not make any recyclable construction materials hazardous.

After collection of any appliances during the project, the quantitative recovery of the ODS present in the appliances (refrigerator, air conditioning unit, car, foam, etc.) is the first and essential part of the project. The de-manufacturing technology has two well separated steps. The first step is essential and should be initiated as soon as possible after the collection of refrigerators as this step recovers the CFC in the cooling circuits which may escape into the atmosphere during a long outdoor storage period. After this step the refrigerators can be stored for months because the CFC in the insulation foam is more contained and can escape only through a slow degradation and diffusion process.

The de-manufacturing capacity of the Step I unit is 60-70 refrigerators per hour, approximately 200,000 refrigerators per one shift per year. Its cost is three x US$ 315,000 for two arms manipulator with a capacity of only 20-24 refrigerators/hour. The cost of three two arms manipulators and three CFC-12 extraction units with oil/gas separation with a capacity of 60-70 refrigerators per hour will be about US$ 1.0 million in order to accommodate the primary quantity of 200,000 old refrigerators per year - the project target. This amount is requested by the MLF.

The Step II treatment plant is designed to shred cooling appliances and separate the different materials of the appliance casings while recovering to a large extent the CFC blowing agent contained in the insulating foams. For this purpose, the appliance casings are put into a closed system and shredded in a two-stage shredding system; the resulting mixture of materials is then divided by means of an air separating system. The cost of a shredding plant is about US$ 4.0 million, which can provide the destruction capacity of

60-70 refrigerators per hour, i.e. about 200,000 refrigerators per year - the project target - and this amount will be generated by the project itself through the Carbon Trading Programme.

A detailed monitoring plan has to be worked out at the project implementation stage. For the purpose of this document an overview of the monitoring procedure for the most important parameter ODS recovered and destroyed is provided. The monitoring procedure is based on direct measurement of the amount of CFC destroyed due to the project activity. CFCs must be in a gaseous/liquid form before destruction. Direct incineration of foam is not permitted since composition and quantities of CFCs cannot be determined acceptably.

7.2.3 Non-investment Component

The implementation of the demonstration project will need to be closely aligned and coordinated with the local legislation. Furthermore, capacity building aspects must be considered. The project will not only address destruction, because the environmental and economic benefits mainly depend on successful marketing of the recovered construction materials (steel, plastics, rubber, aluminium, glass, etc.). These activities will need to be supported through the provision of a technical support component to ensure that the collection of the many thousand tonnes of recovered material can be sold.

The project also develops and implements training, awareness and capacity-building activities for key government departments, legislators, decision-makers and other institutional stakeholders, to ensure a high-level commitment to the project objectives and obligations. It also creates awareness among consumers and the public of the project and government initiatives in the sector through workshops, media publicity and other information dissemination measures.

Furthermore, it is necessary to prepare documentation under Carbon Trading Scheme (CAR, USA) for CFC-12 incineration in the USA according to the Article Ozone Depleting Substances Project Protocol – Destruction of Article 5 ODS banks [CAR ODS Protocol] and CFC-11 incineration under VSC standard.

7.4 Cost-benefit Analyses

The project deals with an annual de-manufacturing of 200,000 pcs of end-of-life refrigerators. A de-manufacturing capacity of the equipment, Step I and Step II, was accepted to be 60-70 refrigerators per hour in one shift (200,000 pcs per year). According to the calculations 26 MT of CFC-12 and 64 MT of CFC-11 are to be extracted from 2000 pcs of refrigerators, and the total quantity of 90 MT is to be incinerated in the selected destruction plant. For details see Annex 1. The estimated emission reductions in tonnes of CO_2e per year are: 390,528 (Phase B).

The same approach can be considered for rough emissions reductions calculations emanated from 119.7 (2007-2009) of CFC-12 of the Phase A of the project 119.7 /2 =

59.85 MT per year, 59.85*10720 * 0.98 * 1.0 = 628,760 tCO_2e, 80% is 503,008 tCO_2e (Phase A). The detailed calculations of the estimated emission reductions in Phase A and B as well as the related cost associated with CFC destruction are given in Annex 1 and 2. The total cost in Annex 2 is associated with the benefit, which is accumulated over the years to get sufficient funds to purchase a shredding plant. According to Annex 2 this may be possible five years after the start of the project implementation. We estimate that the cost of a GHG emissions reduction unit under the CAR is US$ 3.0 per 1.0 ton CO2e which is considered to be the most conservative figure. It is expected that this unit may cost US$ 4.0-5.0 in 2011. The shredding plant could then be purchased after three years.

The start date of the project activities will be immediately after the approval of the project by the ExCom. A crediting period for carbon trading is defined as the time period over which a project will issue GHG reduction units. Based on a review of current practice most GHG reduction projects will receive credits over a period of 10 years (e.g. CAR and/or VCS). Therefore, the project timing will include a period of two years under MLF financing to set up CFC-12 destruction facilities in Mexico and 10 years additional time when CFC-12 and CFC-11 destruction is financed separately to cover the crediting period.

The project cost estimate is given in the table below:

No	Project component	Cost estimate	Comments
1	Non-investment component including preparation of Carbon Trading documentation	US$ 203,500	To be funded by the MLF
2	Policy management support	US$ 214,500	To be funded by the MLF
3	Strengthening of the centralized facility for ODS collection	US$ 257,075	To be funded by the MLF (can be funded through Carbon Trading component, or a contribution from scrapping industries)
4	Cost for CFC incineration and transportation calculated on a two year basis	US$ 738,980	To be funded by the MLF
5	Cost of the three CFC-12 recovery units with separation of oil and gas and a liquefaction stage	US$ 1,000,000	To be funded by the MLF
6	Cost of a shredding plant with CFC-11 extraction and a liquefaction stage	US$ 4,000,000	Generated by Phase B of the project under the Carbon Trading Scheme
	Sub-total (without item 6)	**US$ 2,414,055**	To be funded by the MLF
	Project total cost	**US$ 6, 414,055**	**To be funded by Carbon Trading Scheme**

8. FUTURE ENVIRONMENTAL BENEFIT

Article 5 countries can benefit from the efforts and achievements of the developed countries that have aggressively regulated the containment of CFCs and continue to realize that household appliances represent a significant amount of un-captured CFCs if not treated.[2]

This ODS destruction project has direct and indirect environmental benefits. ODS collection and processing is a two stage process:

a) ODS contained in the cooling loop

b) ODS contained in the blowing agents of polyurethane foam (PUR).

Any process worth pursuing should be an integrated process from the start. This has the following benefits:

a) The scrap processing industry will have to stop using the poor practices which have developed over the years;

b) It creates useful by-products from scrap refrigerators allowing the industry to be self-supporting (steel, copper, aluminum, plastics) beyond reliance on carbon markets. (The value of a refrigerator when completely processed is significant.);

c) It is the best available technology as demonstrated by European companies (URT, SEG, Meva, etc.);

d) Complete processing dramatically reduces landfill requirements, which has tremendous environmental benefits beyond ODS;

e) It creates sustainable jobs.

As this project moves forward additional and continued funding is available through the derivative environmental instruments, carbon credits.

9. CONCLUSIONS

a) This ODS destruction project concept should not be viewed as an attempt to change policy or legislation. The total project as submitted was a forward thinking approach to the more detailed and complex issues that all parties are now considering. There is a concern regarding the material that has been used in comfort cooling and a growing need to recover and dispose of the materials that are contained and has been used in appliances. We address the growing concerns over the CFCs contained in the foam blown insulation of refrigerators and freezers. These concerns should be addressed considering their negative effect on the achievements of the international community.

b) It would be of great environmental benefit to fund this opportunity to treat the ODS bank that is currently being held in Mexico. Funding the destruction element of this project will provide for future revenue also for on-going operations to contain HCFCs and HFCs.

[2] RAD Environmental Benefit, United States Environmental Protection Agency, 2007 to 2009

c) The ExCom guidelines for the funding of demonstration projects for the disposal of ODS in accordance with paragraph 2 of decision XX/7 of the MOP need to be re-considered by the ExCom in order to allow the formulation of ODS destruction projects in Article 5 countries.

d) The MP project has to assist in establishing a policy development and enforcement programme, covering various legislative, regulatory, incentive, disincentive and punitive actions to enable the government to acquire and exercise the required mandates in order to execute this project. It has to assist in establishing and operating a reporting system for collected refrigerators, end-of-life separated CFCs, foams, construction materials to be recycled as well as halons to be destroyed.

e) The ODS destruction project has to strengthen ODS recovery and recycling networks in Article 5 countries through the provision of necessary ODS collection and transportation equipment to enable them to collect and dispose of ODSs.

f) The ODS destruction project concept for Article 5 countries developed by UNIDO with a reference to the project in Mexico is for review and discussion by the ExCom. Its endorsement would allow Article 5 countries to submit ODS destruction project proposals which would contribute to the essential ODS emissions reduction from the ODS banks.

g) Failure to destruct the stockpiles of unwanted CFCs will result in a significant reversal of the accomplishments made over the past ten years. The issue of phasing out HCFCs, and probably HFCs, is central today but should not overshadow the critical problem of CFCs banks that present great risks to the ozone layer and a threat to our climate.

Annex 1. Calculation of emission reductions as per UNIDO project in Mexico

The following assumptions have been taken into consideration. The project deals with the annual de-manufacturing of 200,000 pcs of end-of-life refrigerators and a de-manufacturing capacity of the equipment, Step I and Step II, was accepted as 60-70 refrigerators per hour in one shift (200,000 pcs per year). Due to some assumptions given in the project proposal some 26 MT of CFC-12 and 64 MT of CFC-11 are to be incinerated.

Assumptions for emission reductions calculations

		Unit
CFC11 destroyed in year y	64.00	tODS
CFC12 destroyed in year y	26.00	tODS
GWP CFC11 (contained in foam)	4680	
GWP CFC12 (gaseous or liquid)	10720	
EF CFC11	0,32	tCO2/tCFC11
EF CFC12	0,36	tCO2/tCFC12
CO2DIS	0,0002	tCO2/tODS*km
DISy	2000	Km
AF CFC11	0,4	
AF CFC12	1	

The following equations have been used to estimate emission reductions (based on CCX, 2009, adapted):

$$ER_y = BE_y - PE_y$$

Where

ER_y	*is total emission reductions in year y*	*(tCO_2e)*
BE_y	*is baseline emissions in year y*	*(tCO_2e)*
PE_y	*is project emissions in year y*	*(tCO_2e)*

$$BE_y = ODS_{destroyed,y} * GWP * 0.98 * AF_{ODS}$$

Where

BE_y	*is baseline emissions in year y*	*(tCO_2e)*
$ODS_{destroyed,y}$	*is total ODS destroyed in year y*	*(tODS)*
GWP	*is Global Warming Potential of ODS destroyed*	*(CO_2e/tODS)*
0.98	*is destruction removal efficiency*	
AF_{ODS}	*is an adjustment factor to reflect the current/future disposal practice for the specific ODS (for the purpose of this document 0.4 for CFC-11 as per the CAR and 1 for CFC-12)*	

BECFC-12: 26.0 * 10720 * 0.98 * 1.0 = 273,146 tCO_2e
BECFC-11: 64.0 * 4680 * 0.98 * 0.4 = 117,412 tCO_2e

Total BE_y: 390,558 tCO_2e

Where

PE_y	*is project emissions in year y*	*(tCO_2e)*
$ODS_{CO2,y}$	*is CO_2 emissions from ODS destruction in year y*	*(tCO_2e)*
$Dest_{CO2,y}$	*is CO_2 emissions from fossil fuel combustion in year y*	*(tCO_2e)*
$MS_{CO2,y}$	*is CO_2 emissions from mobile source combustion in year y*	*(tCO_2e)*

$$ODS_{CO2,y} = ODS_{destroyed,y} * 0.98 * EF_{ODS}$$

Where

$ODS_{CO2,y}$	*is CO_2 emissions from ODS destruction in year y*	*(tCO_2e)*
$ODS_{destroyed,y}$	*is total ODS destroyed in year y*	*(tODS)*
0.98	*destruction removal efficiency*	
EF_{ODS}	*is ODS specific emission factor according to equation: =44/(molar mass of ODS/number of C molecules in ODS)*	*(tCO_2e/tODS)*

EF_{CFC-12}=*0.36*
EF_{CFC-11}=*0.32*
$ODS_{dest./y/CFC-12}$= 26.0 * 0.98 * 0.36 = 9.17 tCO_2e
$ODS_{dest./y/CFC-11}$ = 64.0 * 0.98 * 0.32 = 20.07 tCO_2e

$$Dest_{CO2,y} = \sum i(FF_{i,y} * EF_{i,y})$$

Where

$Dest_{CO2}$	*is CO_2 emissions from fossil fuel used in ODS destruction process*	*(tCO_2e)*
FF_y	*is total quantity of fossil fuel i consumed in year y*	*(tfuel)*
EF_y	*is fuel specific emission factor for fuel i*	*(tCO2/tfuel)*

DestCO2,y = 0

$$MS_{CO2,y} = DIS_y * CO_{2DIS}$$

$MS_{CO2,y}$	*is CO_2 emissions from mobile source combustion in year y*	*(tCO_2e)*
DIS_y	*is total distance travelled in transportation of ODS material*	*(km)*
CO_{2Dis}	*is CO2 emissions per unit of ODS and distance transported.* *For road transportation the emission factor is assumed to be 0.0002*	*tCO2/tODS*km*

2000km * 0.0002 = 0.4 tCO_2e
$PE_{y\ CFC-12}$ = 9.17+0+ 0.4 = 9.57 tCO_2e
$PE_{y\ CFC-11}$ = 20.07+0+0.4 = 20.47 tCO_2e
Sub-total $ER_{y\ CFC-12}$ = 273,146 - 9.57 = 273,136 tCO_2e
Sub-total $ER_{y\ CFC-11}$= 117,412 - 20.47 = 117,392 tCO_2e
Total (**Phase B**): **390,528** tCO_2e.

ANNEX 2. Annual Incremental costs and Potential Incomes for the Whole Period of the Project (Phase A & Phase B)

Carbon related Cash Flows (USD)	Unit, US$	Phase A		Phase B									
Year		1	2	1	2	3	4	5	6	7	8	9	10
Income													
CFC-12 collected, tCO2e - 119.7/2=59,5 x 0.8 about 500,000		500,000	500,000										
CFC-12 collected, 273,136 x 80% under CAR, tCO2e				218,509	218,509	218,509	218,509	218,509	218,509	218,509	218,509	218,509	218,509
Income from CFC-12 at cost of US$ 3.0 per tCO2e under the CAR, US$	3.0	1,500,000	1,500,000	655,527	655,527	655,527	655,527	655,527	655,527	655,527	655,527	655,527	655,527
CFC-11 collected, 117,392 x 80% under VCS, tCO2e				93,914	93,914	93,914	93,914	93,914	93,914	93,914	93,914	93,914	93,914
Income from CFC-11 at cost of US$ 3.0 per tCO2e under the VCS, US$	3.0			281,742	281,742	281,742	281,742	281,742	281,742	281,742	281,742	281,742	281,742
Cost													
PIN (project structuring)		-15 000											
PDD/MP/Validation Support/Registration		-70 000											
Legal Advice		-35 000	0		0								
Validation			-35 000										
Monitoring				-25 000	-15 000	-15 000	-15 000	-15 000	-15 000	-15 000	-15 000	-15 000	-15 000
Verification					-25 000	-25 000	-25 000	-25 000	-25 000	-25 000	-25 000	-25 000	-25 000
Verification Support					-20 000								
Cost of CFC-12 sells (2007-2009) from 98 scrapping companies, 119.7/2	4.0	-239,400	-239,400										
Cost of CFC-12 (2011) sells from 98 scrapping companies, 26 MT	4.0			-96,000	-96,000	-96,000	-96,000	-96,000	-96,000	-96,000	-96,000	-96,000	-96,000
CFC-12 incineration costs in the USA (26.0 MT)	5.0			-130,000	-130,000	-130,000	-130,000	-130,000	-130,000	-130,000	-130,000	-130,000	-130,000
CFC-11 incineration costs in Mexico (64.0 MT)	3.0			- 192,000	- 192,000	- 192,000	- 192,000	- 192,000	- 192,000	- 192,000	- 192,000	- 192,000	- 192,000
Energy running cost for de-manufacturing (Step I + Step II)				-38,400	-38,400	-38,400	-38,400	-38,400	-38,400	-38,400	-38,400	-38,400	-38,400
Wages for running de-manufacturing, 6 workers in one shift, US$ 1,000 per month				-72 000	-72 000	-72 000	-72 000	-72 000	-72 000	-72 000	-72 000	-72 000	-72 000
Renting a truck to transport CFC-12 to the USA and CFCs and refrigerators in Mexico		-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000	-9 000
Transportation of CFC-12 to destruction in the USA		-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100	-2,100
Transportation of collected fridges in Mexico		-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000	-2,000
Handling agent fee at the USA border		-800	-800	-800	-800	-800	-800	-800	-800	-800	-800	-800	-800
Total Costs, US$		1,126,700	1,211,700	369,969	334,969	334,969	334,969	334,969	334,969	334,969	334,969	334,969	334,969