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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixty-third Meeting
Montreal, 4-8 April 2011

PROJECT PROPOSALS: MEXICO

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

Aerosol

- Phase-out of HCFC-22 and HCFC-141b in aerosol manufacturing at Silimex — UNIDO

Destruction

- Demonstration project for disposal of unwanted ODS in Mexico — UNIDO/FRANCE

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECTS
MEXICO

PROJECT TITLE		BILATERAL/IMPLEMENTING AGENCY
(a)	Phase-out of HCFC-22 and HCFC-141b in aerosol manufacturing at Silimex	UNIDO

NATIONAL CO-ORDINATING AGENCY	National Ozone Office, SEMARNAT

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2009, AS OF MARCH 2011)

Annex C, Group I	1,125.9

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2009, AS OF MARCH 2011)

Substance	Consumption by sector (ODP tonnes)						
	Aerosol	Foam	Ref. manu.	Ref. serv.	Solvent	Other	Total
HCFC-22	30.17	29.15	198.0	260.73			518.05
HCFC-141b	30.58	269.50	305.25				605.33

HCFC consumption remaining eligible for funding (ODP tonnes)	n/a

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US $	Phase-out (ODP tonnes)
	(a)	1,000,000	10.0

PROJECT TITLE:	(a)
ODS use at enterprise (ODP tonnes):	11.06
ODS to be phased out (ODP tonnes):	11.06
Project duration (months):	30
Project costs (US $):	
Incremental Capital Cost:	282,200
Contingency (10 %):	28,220
Incremental Operating Cost:	210,496
Total Project Cost:	520,916
Local ownership (%):	100
Export component (%):	0
Requested grant (US $):	520,916
Cost-effectiveness (US $/kg):	3.8
Implementing agency support cost (US $):	39,069
Total cost of project to Multilateral Fund (US $):	559,985
Status of counterpart funding (Y/N):	Y
Project monitoring milestones included (Y/N):	Y

SECRETARIAT'S RECOMMENDATION:	For individual consideration

PROJECT DESCRIPTION

Introduction

1. UNIDO, on behalf of the Government of Mexico, has submitted to the 63rd Meeting a phase-out project entitled "Phase-out of HCFC-22 and HCFC-141b in aerosol manufacturing at Silimex". Project preparation funding for this project at been approved at the 58th Meeting. The enterprise is a manufacturer of technical aerosol products, consuming 60.48 metric tonnes (mt) (3.3 ODP tonnes) of HCFC-22 and 70.24 mt (7.73 ODP tonnes) of HCFC-141b. The funding requested for the implementation of the project is US $520,916 plus support costs of US $39,069 for UNIDO.

2. The agency submitted the project initially to the 62nd Meeting with an associated funding request of US $1,108,404 plus agency supports cost on the basis of, *inter alia*, a request for incremental operating costs (IOC) for a duration of four years. In decision 62/9 the Executive Committee requested UNIDO to re-submit the project proposal to the 63rd Meeting on the basis of IOCs being determined for a duration of one year for this project.

Country and sector background

3. Silimex is by far the largest enterprise in the aerosol sector in Mexico in terms of consumption in ODP tonnes. In total, nine enterprises are active in the sector, of which all are using HCFC-22 and six are also using HCFC-141b. The impact of the proposed project is to phase out the use of 60.48 mt of HCFC-22 and 70.24 mt of HCFC-141b representing, in total, 52.3 per cent of the ODP tonnes to be phased out in the sector. The project proposal was accompanied by a detailed description of the aerosol sector in Mexico, including the names of all enterprises consuming HCFCs in that sector, and their quantities of consumption since 2007.

4. UNIDO has informed the Secretariat that Mexico is consuming in the aerosol sector 426.03 mt (23.43 ODP tonnes) of HCFC-22 and 117.17 mt (12.89 ODP tonnes) of HCFC-141b as an average of the years 2007 to 2009. HCFC propellants are often used in cases where hydrocarbon aerosol propellants (HAPs) cannot be used out of technical reasons. Consequently, contrary to the situation when phasing out CFCs, replacement technologies are often less cost effective for the manufacturer than the current HCFCs, and extra efforts are necessary to achieve sustainability of the conversion. The project proposal contained information on the current licensing system to control the imports of ODS including HCFCs. Currently, HCFCs are not covered by a quota. The project proposal points out that it is doubtful as to whether any regulatory action concerning HCFC restrictions for aerosols alone would be effective or enforceable, since a ban only for this sector could simply lead to illegal use of the abundantly available HCFCs. In this context, the project proposal indicates the intention to work towards voluntary controls involving the HCFC manufacturers and importers in Mexico, to support a strategy to reduce the amount of HCFCs used in the aerosol sector.

5. At its 59th Meeting the Executive Committee had approved a project for the conversion from HCFC-141b and HCFC-22 in the manufacturer of polyurethane (PU) rigid insulation foam for domestic refrigerators at Mabe. That project eliminated 55.87 ODP tonnes, representing 4.6 per cent of the starting point of Mexico, which was the reported consumption in 2008 when the said foam project had been submitted. The current project will contribute an additional one per cent reduction of the tonnage selected as a starting point. The project proposal forecasted a submission of the HPMP to the 64th Meeting of the Executive Committee, with focus mainly on the phase-out of HCFC-141b in the PU foam and refrigeration insulation foam sub-sectors.

Company profile

6. Silimex was founded in 1969 with initially two main products, silicon mold release and electrical cleaners. The enterprise is 100 per cent Mexican owned, and its annual production is about 500,000 cans of various products. When other Mexican enterprises converted from CFCs to propane/pentane, Silimex did not convert because of two reasons: HAPs could not safely be filled in their plant without a significant plant change, creating the need for significant investment, and their principle client wanted a completely non-flammable product. When the uses of CFCs in the aerosol sector were phased out, Silimex converted with its own funding to HCFCs. The enterprise presently has two aerosol filling machines which cannot be retrofitted to HAPs.

Technology selection

7. The project proposal points to the significant variation and sale of aerosol products and to the unpredictability for future markets. Therefore, the project proposal could contain only indicative, i.e. historical data as to which different products could be converted to which technologies. It was pointed out that Silimex produces technical aerosols, which have specific use requirements that often cannot rely on the use of HAPs. Table 1 provides an overview of the different products, their current HCFC use and the different alternatives for those products.

Table 1: Products manufactured at Silimex and their use of current and alternative technologies

Product	**Annual consumption before conversion (mt)**		**Annual consumption after conversion (mt)**			
Propellant	HCFC-22	HCFC-141b	HAP	HFC-152a	HFC-134a	HFC-365mfc / HFC-227ea
Silijet	3.2	9.6	5.6	0	0	0
Silimpo	3.2	0	3.2	0	0	0
Silijet, non flammable	19.2	57.6	0	57.6	0	0
Aerojet	28.8	0	0	28.8	0	0
Compuklin	6.08	3.04	0	0	9.12	3.04
Sub-total	60.48	70.24				
Total		130.72	8.8	86.4	9.12	3.04

Conversion activities foreseen in the project proposal

8. UNIDO requests funding that would in particular allow the use of flammable alternatives, including storage tanks, one new aerosol filling machine, propellant pumps, accumulators, mixers, ventilation and extraction systems, leak detectors, as well as other safety equipment and technical assistance. The total funding requested for capital items and technical assistance is US $310,420. In addition, UNIDO calculated operating cost at a level of US $210,496 for a duration of one year. The implementation of the project will be completed at the end of the 2012 or in the first quarter of 2013, and will therefore support Mexico in achieving the 2013 freeze on HCFC consumption.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Starting point

9. When the project for the conversion from HCFC-141b and HCFC-22 in the manufacturer of polyurethane (PU) rigid insulation foam for domestic refrigerators at Mabe was submitted to the 59th Meeting of the Executive Committee, the Committee had not yet clarified whether a starting point needed to be established with the project submission. The decision of the Executive Committee on that project consequently does not provide for the selection of a starting point; however, the Government of Mexico has selected the year 2008 as the country's starting point, which is the year of the latest reported consumption when the project at Mabe was approved. The Secretariat included therefore language in the recommendation to establish the starting point for Mexico at the level of its 2008 consumption of 1,214.8 ODP tonnes, consisting of 7,459.7 mt of HCFC-141b, 7,142 mt of HCFC-22, 16 mt of HCFC-142b, 13.9 mt of HCFC-123 and 2.7 mt of HCFC-124.

Environmental issues

10. UNIDO proposes to introduce four different alternative technologies for the five different products manufactured at Silimex. The alternative technologies include the flammable but low or relatively low global warming potential (GWP) hydrocarbons (HAP) and HFC-152a; HFC-134a with a GWP of 1,430, which is only marginally lower than the GWP of the combined HCFC-22/HCFC-141b propellant with a weighted GWP of 1,448; and a mixture of HFC-365mfc/HFC-227ea. The composition of the latter mixture, where HFC-227 has a very high GWP, has not been provided in the project proposal; however, the sole manufacturer of both HFC-365mfc and HFC-227ea proposes for aerosol applications a content of seven per cent of HFC-227ea versus 93 per cent HFC-365mfc; the HFC-227ea is mixed into the HFC-355mfc in order to ensure non-flammable characteristics of the mixture. On this basis the GWP of the mixture would be 964.

11. Using these figures, the Secretariat has calculated the climate impact of the conversion as savings of 133,531 tonnes of CO_2 equipment as shown in Table 2. The calculations carried out by the Secretariat are dependent on the product mix of Silimex, which can, as pointed out by UNIDO, change significantly depending on market conditions. The savings based on the historical product mix show a reduction in warming impact by a factor of 5.97.

Table 2: Climate impact of the conversion of Silimex

Product	**Annual warming impact before conversion (t CO_2E)**	**Annual warming impact after conversion, by propellant technology (t CO_2E)**					**Climate impact of conversion (t CO_2E)**
Propellant technology	HCFC-22 / HCFC-141b	HAP	HFC-152a	HFC-134a	HFC-365/227	Total, by product	
GWP (100a)	1,810 / 725	20	124	1,430	964	-	
Silijet	12,752	112	0	0	0	112	-12,640
Silimpo	5,792	64	0	0	0	64	-5,728
Silijet non flammable	76,512	0	7,142	0	0	7,142	-69,370
Aerojet	52,128	0	3,571	0	0	3,571	-48,557
Compuklin	13,209	0	0	13,042	2,931	15,973	2,764
Total	160,393	176	10,713	13,042	2,931	26,862	133,531

*assuming a 93/7 mixture of HFC-365mfc/HFC-227ea

Cost issues

12. The original submission to the 62nd Meeting of the Executive Committee included a request for four years of IOCs. The Committee clarified, in its decision 62/9, that IOC would be funded only for a duration of one year. The Secretariat had also raised a number of issues such as, costs for a water bath, conveyers, and the cost for an aerosol-filling machine. All cost issues except for IOC had been resolved prior to the 62nd Meeting. The project submitted by UNIDO to the 63rd Meeting took these issues into account as well as decision 62/9 into account and was submitted with the previously agreed level of incremental cost. The different items and the agreed cost are shown in Table 3:

Table 3: Incremental capital cost for the conversion of Silimex

Item	Quantity	Cost per unit (US $)	Total cost (US $)
5000 litre HAPs storage tank	2	4,000	8,000
Manual single station aerosol filling machine, flammable propellant	1	50,000	50,000
Propellant pump and accumulator	1	10,000	10,000
Construct open air gassing room	1	12,000	12,000
Manual water bath	1	19,000	19,000
Ventilation / extraction system	1	14,000	14,000
Wall / floor mounted gas sensor	2	4,000	8,000
Portable gas sensor	1	1,000	1,000
Crimp gauges	1	1,200	1,200
Piping	1	4,000	4,000
Conveyors (in and out of additional room)	2	6,000	12,000
Batch mix tank, mixer, equipment	1	12,000	12,000
Fire alarm / fire protection system	1	24,000	24,000
Research, development, adapting of mechanical and fluid properties of the product, development and distribution of new product specifications and information for 5 products	5	20,000	100,000
Safety review, audit	1	7,000	7,000
Sub-total			282,200
Contingencies	10%	282,200	28,220
Total			310,420

RECOMMENDATION

13. The Executive Committee may wish to:

(a) Approve the investment project for phase-out of HCFC-22 and HCFC-141b in aerosol manufacturing at Silimex at a level of US $520,916 plus agency support costs of US $39,069 for UNIDO, and to reduce the remaining eligible consumption for Mexico by 60.48 metric tonnes (3.3 ODP tonnes) of HCFC-22 and 70.24 metric tonnes (7.73 ODP tonnes) of HCFC-141b; and

(b) Note that the Government of Mexico has agreed to establish as its starting point for sustained aggregate reduction in HCFC consumption reported consumption for the year 2008 of 1,214.8 ODP tonnes, which was the latest data available when the HCFC project for Mabe was approved at the 59th Meeting; and

(c) Reduce the remaining eligible consumption for Mexico by 507.9 mt (55.87 ODP tonnes) of HCFC-141b related to the conversion of the manufacturing of insulation foam for domestic refrigerators at Mabe as per decision 59/34(b).

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

MEXICO

PROJECT TITLE	**IMPLEMENTING AGENCY**
Demonstration project for disposal of unwanted ODS in Mexico	UNIDO FRANCE

NATIONAL CO-ORDINATING AGENCY: Ministry of Environment - SEMARNAT

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES in 2009)

Annex I, CFC	-101.7		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2009)

ODS	**Subsector/quantity**	**Subsector/quantity**	**Totals**
CFC-11 / CFC-12			125

CURRENT YEAR BUSINESS PLAN: Total funding US $ 1,064,000 Total phase-out 11.9 ODP tonnes

PROJECT TITLE

ODS USE AT ENTERPRISE		n/a
ODS TO BE PHASE-OUT		n/a
ODS PHASED IN		n/a
PROJECT IN CURRENT BUSINESS PLAN		Yes
SECTOR		ODS Destruction
SUB-SECTOR		Refrigeration and Air-conditioning (CFCs)
PROJECT IMPACT		166.7 metric tonnes of CFC-12
PROJECT DURATION		2 years
LOCAL OWNERSHIP		100%
EXPORT COMPONENT		0%
REQUESTED MLF GRANT	US $	1,522,915
IMPLEMENTING AGENCY SUPPORT COST (9%)	US $	141,179
TOTAL COST OF PROJECT TO MLF	US $	1,664,094
COST-EFFECTIVENESS	US $/kg	9.14 ODS(metric)
PROJECT MONITORING MILESTONES		Included

SECRETARIAT'S RECOMMENDATION:	Individual Consideration

PROJECT DESCRIPTION

Introduction

14. On behalf of the Government of Mexico UNIDO, as the lead implementing agency, has submitted to the 63rd Meeting a proposal for a demonstration project for disposal of unwanted ozone-depleting substances (ODS) at a cost of US $1,522,915 as originally submitted. The project will also be implemented with the assistance from the Government of France. This project is submitted in line with decision 58/19 and will address the destruction of 166.7 metric tonnes (mt) of waste ODS in the country. The Government of Mexico is requesting the approval of this project at the 63rd Meeting.

15. At the 57th Meeting, the Executive Committee provided funds for UNIDO to prepare a pilot ODS demonstration project for Mexico. At that Meeting the decision was taken to look at pilot ODS disposal projects that would respond to decision XX/7 of the Twentieth Meeting of the Parties, which stated that pilot projects could cover the collection, transportation, storage and destruction of ODS, with a focus on assembled stocks with high net global warming potential (GWP), and in a representative sample of regionally diverse Article 5 countries. The Parties also stressed that ODS disposal demonstration projects should be feasible, and should include methods of leveraging co-funding. Mexico was one of the countries selected based on this criteria.

Background

16. At the 58th Meeting of the Executive Committee, criteria and guidelines for the selection of ODS disposal projects were discussed, and led to decision 58/19. This decision established the basis for the review and approval of ODS disposal demonstration projects, and the review carried out by the Secretariat was based on the principles established through it. The Secretariat would like to emphasise that it applied sub-paragraph (a)(ii)a of the decision, which specified that no funding would be available for the collection of ODS. The definition for the collection of ODS was included in Annex VIII to the Report of the 58th Meeting, called “Definitions of activities included in the interim guidelines for the funding of demonstration projects for the disposal of ODS”. The demonstration project for Mexico will cover ODS already collected as well as additional amounts to be collected under the accelerated replacement programme for old refrigerators with new energy-efficient models, led by the Government of Mexico through the Fund for Energy Savings (FIDE).

Project description

17. This pilot project will initially address the disposal of the 166.7 tonnes of CFC-12 that have already been collected and are ready for destruction. At the same time, it will put in place measures to support the sustainability of the project by expanding the current system of ODS waste collection, and putting in place state of the art recovery and collection technologies which would increase the collection of ODS waste. The objective of the demonstration project, which will be implemented in two years, is to establish a sustainable business model for an efficient ODS waste management system that will explore the export of ODS for destruction and look at the possibility of selling the emissions from the ODS, which will be destroyed to reap financial benefits to sustain broader destruction activities in the country after the demonstration phase. The project will also be supported through government policies that promote advanced environmental policies (such as a ban on venting of ODS, defining responsibility for financing recycling programmes) that will support the sustainability of the business model for ODS waste management.

18. As mentioned above, the proposed project is closely related to a national incentive programme for the retirement of domestic refrigeration and air-conditioning equipment. This incentive programme was organized in 2005, where 604,000 domestic refrigerators were replaced and subsequently destroyed. In 2007 and 2008, 98 scrapping centres received equipment for recovery of refrigerants from the old

appliances that were dismantled in these centres. In 2009 the Government established another ambitious programme under the Efficient Lighting and Appliances Project (ELAP) for substituting domestic refrigerators with the goal to collect and replace 1.6 million appliances until the end of 2012. This programme is expected to be a major source of waste ODS that will feed into this project in its demonstration phase.

19. The ODS waste will be destroyed in a destruction facility that is compliant with both the international standards specified in the Technology and Economic Assessment Panel (TEAP) Report of the Task Force on Destruction Technologies and Code of Good Housekeeping. This project will focus exclusively on the destruction of waste CFCs, no CTC or halon will be involved in this pilot project.

Estimation of the ODS to be disposed

20. The Mexican Ministry of Environment and Natural Resources (SEMARNAT) confirmed the amount of CFC-12 of 119.7 mt already collected by 2009, and additional estimate of CFC-12 to be collected in 2010 (i.e. 40 mt from old refrigerators and air-conditioners and 7.0 mt from chillers), totalling 166.7 mt. The estimated quantities are shown in Table 1.

Table 1: Estimated quantities of ODS-waste that will be used in the project

Batch	Description	CFC-12 collection (mt)
1	ODS surplus collected between 2007-2009	119.7
2	ODS surplus to be collected in 2010 year	40.0
3	ODS surplus to be collect from Chillers	7.0
	Total	166.7

Financial management of the project

21. The proposal envisaged that funding from the Multilateral Fund will cover the costs of destruction of the currently available ODS waste by exporting it for destruction to an accredited destruction facility in the United States. The demonstration project also foresees the design of a system that will monetize carbon credits resulting from the ODS to be destroyed, which will be used to scale up the project, depending on the results of the pilot activity. The demonstration project assumes a conservative price of US $3.00 per tonne of CO_2-equivalent in either climate reserve tonne (CRT) or voluntary carbon units (VCU), and assumes emission reductions of approximately 1.8 million CO_2-equivalent tonnes, for the activities during the first two years. This tonnage is expected to generate a financial value of around US $5 million through utilization of the carbon market.

Monitoring and verification of the destruction

22. In order to ensure that all the ODS are properly monitored and accounted for, a monitoring plan will be established for all operations and reporting activities associated with this ODS destruction project. It will stipulate the frequency of data collection; a record keeping plan; the role of each individual involved in monitoring; quality control provisions to ensure that operations, data acquisition and ODS analyses are carried out consistently and with precision; and will develop data management systems and coordination of data between ODS aggregators, project developers, and destruction facilities. The monitoring mechanisms of both the Climate Action reserve (CAR) and Voluntary Carbon Standards (VCS) will be used as the basis for developing this monitoring system. This should ensure that the monitoring procedure will allow the independent external verification of the destroyed ODS for certification of carbon credits. Within the Government of Mexico, SEMARNAT will be responsible for overseeing the monitoring system.

Cost of the project

23. The total cost of the project has been estimated at US $1,522,915 as originally submitted shown in the table below.

Table 2: Proposed cost of the project

Activity	Number of Units	US $/Unit	Cost (US $)
Transportation of dispersed ODS within Mexico to centralized facility to aggregate in ISO containers for transport to United States	1	20,000	20,000
ISO Container (10,000 litres)	3	20,000	60,000
Transport of Aggregated CFC-12 to US destruction facility (e.g. clean harbors El Dorado, Arkansas)	27	6,023	162,618
Destruction of CFC-12 already collected by existing energy efficient appliances replacement programmes in Mexico	166,700	5.5	916,850
Monitoring and verification of ODS destruction	2	40,000	80,000
Carbon market project management (International Experts)	7 w/m	115,000	115,000
Health Safety Environment Training	1	30,000	30,000
Contingencies 10% (of total costs)			138,447
Total			1,522,915

24. While UNIDO clearly indicated that the funding being sought at this Meeting is for the demonstration portion of the project only, it had provided information and documentation related to the proposed subsequent phase of the project which will ensure the continued and sustained operation of the destruction facility.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

25. The Secretariat provided UNIDO with a number of comments and observations on the proposal, which was reviewed following the criteria set out in decisions 58/19 and 62/69. It noted that, as submitted, the proposal contained detailed information about Phase II where funds were not being requested. It also made clear to UNIDO that the Secretariat's views and comments will be limited to the demonstration project as provided for in the interim guidelines agreed in decisions 58/19 and 62/69, and the consideration of the second phase will only be to determine the viability and sustainability of the project in future. This would therefore allow the Secretariat to follow a consistent approach in reviewing similar ODS demonstration projects. It advised UNIDO to revise the proposal and focus only on the 2-year demonstration period, results of which will eventually lead to the succeeding 10-year project, and describe how the results provide solutions for the technical, financial, regulatory and institutional barriers and risks in order for the second phase to be implemented. UNIDO made the necessary revisions to the proposal as requested.

26. The Secretariat also requested UNIDO to include information in the proposal as required by decision 58/19, to enable a thorough review of the submission. Additional information was provided, which is described in the paragraphs above. In responding to the query on whether the country had considered other options for the use of the ODS waste other than destruction UNIDO replied that, like many other Article 5 countries, Mexico has tried to explore recycling and reuse opportunities for these waste ODS, but the economical incentives and the price of the recycled substances as compared with new

ones made it non-competitive. In addition, Mexico's proximity to the United States, which is an important trade partner and where CFC use is now banned, necessitates that it explore other means for these waste other than re-use, therefore it is being collected for destruction.

27. In looking at the overall objective of the demonstration project, the Secretariat sought confirmation from UNIDO that the intention is to demonstrate transport for destruction as a viable option for Mexico in future as well as to generate possible income through carbon trading, which will then be used to sustain destruction activities in future. UNIDO confirmed this understanding and underscored the fact that the current stock of ODS waste will be shipped to a destruction facility in the United States, and its corresponding CO_2-equivalent will be traded and used for the future financial viability of the project.

28. The Secretariat raised a number of additional questions with UNIDO, among them the status of the collection of refrigerators in Mexico, the waste flow from scrapping centres to a central facility and their eventual shipment for destruction. UNIDO provided information to the Secretariat which clarified these issues.

29. With regard to the issue of profitability and sustainability of the project, the attention of UNIDO was drawn to the fact that the future price for VERs/VCUs is highly uncertain and, since the income from these is meant to provide sustained funding, it may be useful to give information on other options in the event that the expected income for these emissions is not fully achieved. While UNIDO agreed with the Secretariat's observation on the price of VERs/VCUs, it was confident that a component of the demonstration project which looks at carbon market project management will make the necessary analyses and undertake the verification of documents and sales, which would ensure income from destroyed ODS. According to UNIDO, the Government of Mexico is highly committed to this project and supports it with national policy and will therefore be the driving force behind it.

30. The Secretariat and UNIDO also discussed the funding requested for the project, and noted that the proposal resulted in a cost of US $9.13/kg of ODS destroyed, which is lower than the cost provided for in decision 58/19 of US $13.2/kg of ODS destroyed. The Secretariat sought clarification on some elements of the proposed budget, which UNIDO replied to accordingly.

31. Following these clarifications, the final cost of the project was agreed as submitted, to be US $1,522,915 plus support costs as summarized in Table 2 above.

RECOMMENDATION

32. The Executive Committee might wish to consider:

(a) Noting with appreciation the submission of the Government of Mexico of a demonstration project for ODS destruction to destroy a total of 166.7 metric tonnes of ODS waste;

(b) Approving in principle the implementation of a demonstration project for ODS destruction in Mexico at the amount of US $1,022,915 plus support costs of US $76,719 for UNIDO and US $500,000 plus support costs of US $65,000 for the Government of France; and

(c) Approving the amount of US $1,522,915 at the 63rd Meeting, noting that this approval is on the understanding that no further funds will be available for Mexico for any ODS disposal projects in future.

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MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY	Mexico	**IMPLEMENTING AGENCY**	UNIDO FRANCE
PROJECT TITLE	Demonstration project for disposal of unwanted ODS in Mexico		
PROJECT IN CURRENT BUSINESS PROJECT		Yes	
SECTOR		ODS destruction	
SUB-SECTORS		Refrigeration and Air-conditioners (CFCs) sub-sector	

ODS DESTROYED	Demonstration Project 2 year (CFC-12) and	166.7	ODP MT
	10 year (CFC-12 &CFC-11)	900	ODP MT
	Total	1,066.7	ODP MT
PROJECT IMPACT	Reflecting the net ODP value per annum (Demonstration project) & (10 year project)	83.35 90	ODP MT
	Reflecting annual emissions in CO_2 equivalent in refrigerating sector	469,192	t CO_2e
	10 Year Carbon Trading Offset Phase B Programme (estimate) - 900 MT	CFC-12 - 260 CFC-11 - 640 CFC-12 – 2,731,360 CFC-11 – 1,173,392	ODP MT ODP MT tCO_2e tCO_2e
	Additional 10 Year Carbon Trading Offset Programme (estimate, only CFC-12)	Total CFCs - 3,905,280	tCO_2e

PROJECT DURATION – Demonstration Project			2 years	
CARBON TRADING OFFSET PROGRAMME DURATION -			10 Years	
TOTAL PROJECT DURATION				
PROJECT COSTS -				
	Capital Costs	US$	1,384,469	
	Policy & Management Support		145,000	
	Contingencies	US$	138,447	
	Total Project Costs	US$	1,522,915	
LOCAL OWNERSHIP			100%	
EXPORT COMPONENT			0%	
REQUESTED GRANT				
	MP FUND	US$	1,022,915	
	FRANCE	US$	500,000	
	TOTAL	US$	1,522,915	
IMPLEMENTING AGENCIES SUPPORT COSTS 7.5% - UNIDO, 13% - FRANCE		US$	141,719	
TOTAL COST OF PROJECT TO MULTILATERAL FUND		US$	**1,664,094**	
COST EFFECTIVENESS (1,066.7 OPD MT)		US$/kg	9.14	
STATUS OF COUNTERPART FUNDING			The counterpart contributes funds in kind (premises, labor, lab equipment, CFC collection expenses, etc.)	
NAME OF COUNTERPART			Joint Venture established by Mexican Corporation and Diagnostico y Administracion de Logistica Inversa SA de CV (DALI), Ecofrigo and other companies advised by the Government of Mexico	
PROJECT MONITORING MILESTONES			Included	
NATIONAL COORDINATING BODY			Ministry for Environment SEMARNAT	

Project summary:

Project summary:

UNIDO will submit a Demonstration ODS Destruction Project for Mexico to the 63rd ExCom meeting. This Project will cover the disposal of 1066.7 ODP tons of CFC-12 and CFC-11 in the domestic refrigerator sector in Mexico over 12 years.

In the first 2 years the project will destroy 166.7 ODP tons of used CFC-12 **which have already been collected** from various sources in Mexico. The collected CFC 12 will be incinerated in an eligible destruction facility in the United States as required by the CAR Protocol *Article 5 Ozone Depleting Substances Project Protocol Destruction of Article 5 Ozone Depleting Substances Banks Version 1.0* (see http://www.climateactionreserve.org/) Additionally during this start up phase an effective legislative system for ODS-containing appliances will be established. (The MLF shall fund the transportation/storage and destruction activities of the first 2 years, costs of changing legislation will be covered by income from sale of carbon credits in the 1st year.)

Assuming a price of USD 3 per ton of CO2e and emission reductions of approximately 1,800,000 CO2e, the activities of the first two years will generate a financial value of around 5.4 Mio USD through utilization of the carbon market. This financial benefit will be used to incentivize further ODS waste management and destruction activities **for additional 10 years which will lead to another estimated destruction of 900 ODP tons of CFC-11 and CFC-12.** (Please NOTE: there is no funding requested from the MLF for this 2nd part of the project). This part of the project consists of the recovery of ODS from end of life refrigerators to be collected in Mexico by using state of the art de-manufacturing facilities (step I machinery – CFC12 recovery unit 1 Mio USD) and step II machinery (shredder and ODS extraction 4 Mio USD).

This project is **unique and innovative** in its approach because it demonstrates for the first time:

- That funds from MLF may not only be used for a one time destruction of ODS but will provide a type of "seed money" for implementing a sustainable, comprehensive ODS waste management and destruction system in Mexico for the next 12 years,
- the sourcing of co-funding from the carbon market as proposed by the *Report by the Secretariat on funding opportunities for the management and destruction of banks of ozone-depleting substances (UNEP 2009) and*
- the implementation and operation of state of the art recovery and collection technologies in an article 5 country enabling a dramatic increase of ODS collection and destruction efficiency and thereby significantly reducing the impact on the ozone layer as well as on the global climate.

PREPARED BY	UNIDO (V. Shatrauka)	**DATE**	22 September 2010
UPDATED AND REVISED	UNIDO (C. Plöchl and G. Castellá)	**DATE**	2 February 2011
REVIEWED BY	C. Norris and UNDIO (S. Mohammed)	**DATE**	4 February 2010

Abbreviations

CAR	Climate Action Reserve
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certifie Emission Reductions
CFC	Chlorofluorocarbone
CFI	Carbon Financial Instrument
CO_2e	CO_2-equivalent
CRT	Climate Reserve Ton
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ExCom	Executive Committee of the Multilateral Fund for Implementation of the Montreal Protocol
GHG	Greenhouse Gas
GWP	Global Warming Potential
IET	International Emissions Trading
KP	Kyoto Protocol
LoA	Letter of Approval
MLF	Multilateral Fund for Implementation of the Montreal Protocol
MLS	Secretariat of the Multilateral Fund for Implementation of the Montreal Protocol
MP	Montreal Protocol
ODS	Ozone Depleting Substance
PIN	Project Idea Note
PP	Project Participant
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbons Standard
VCU	Voluntary Carbon Unit

Table of Content

PROJECT OF THE GOVERNMENT OF MEXICO

DEMONSTRATION PROJECT FOR UNWANTED ODS DESTRUCTION IN MEXICO

1 Project Objective and Project Strategy

UNIDO will submit a Demonstration Project for Disposal of Unwanted ODS in Mexico to the 63rd Meeting of ExCom of the Multilateral Fund for the implementation of the Montreal Protocol.

The project aims to develop a business model for ODS waste management 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 can generate carbon credits. This will create 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 programs for profit or for lower cost destruction

Since 2005 the Government of Mexico (GoM) through the Fund for Energy Savings (FIDE) has successfully accelerated the replacement of old refrigeration appliances with new energy efficient ones. In 2007/2008 98 scrapping centers received equipment for recovery of refrigerants from old appliances that were dismantled in these centers. In 2009 the GoM established another ambitious program for substituting domestic refrigerators with the goal to collect and replace 1,600,000 appliances until the end of 2012. Through these and other activities 166.7 tons of ODP CFC-12 were collected by the end of 2010 which are dispersedly stored throughout Mexico.

Even though a large quantity of ODS in absolute terms has already been collected in the replacement programs, , the ODS recovery process is rather inefficient in Mexico. The scrapping centers recovered on average 36g of CFC-12 per fridge, when name plates of fridges indicated 155g content, which is a recovery-efficiency below 25%. Additionally the CFC-11 contained in insulation foams has not been recovered at all so far.

Therefore the objective of the project is to implement a sustainable business model for an efficient ODS waste management system (including the increase of recovery efficiency of CFC-12 from 36g per fridge to 130g and 90% recovery of all CFC-11 contained in insulation foams) and to destroy 1066.7 ODP tons of CFC-12 and CFC-11 in the refrigerator sector in Mexico over 12 years by

1. Destroying already collected 166.7 ODP tons of CFC-12 (in the first two years of the project is considered as the Demonstration phase) (to be funded by the MLF)

2. Investing the financial benefits created through the use of the carbon market *(by selling the emission reductions generated through destruction activities in the first 2 years)* in modifying /improving local legislation with regard to a producer/distributor responsibility program for ODS containing equipment and in a new state of the art facility for de-manufacturing end-of-life refrigerators and recovering ODS. This will result in annual destruction of additional 26 ODP tons of CFC-12 and 64 ODP tons of CFC-11 adding up to 900 ODP tons over a 10 years period. (to be sustainable funded through the annual sale of carbon credits)

The proposed project facility (not to be funded by the MLF) will recover CFC-12 and CFC-11 from domestic refrigerators using a two-step approach:

1. 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 dissolved in it in order to increase the efficiency of the CFC-12 recovery; and

2. In Step II, the refrigerator without CFC12 and oil is placed into a shredder, where, after shredding operation the shredded materials are sorted and the polyurethane foam insulation panels of the refrigerator finely grounded. This destroys the cell structure of the foam and releases a significant portion of the CFC-11 within the cells. The insulating gas/blowing agent (CFC) released is collected, adsorbed in activated carbon and, following desorption from the activated carbon, liquefied under pressure by means of compressors.

The facility will be operated by a joint venture consisting of the Mexican corporations Diagnostico y Administracion de Logistica Inversa SA de CV (DALI), Ecofrigo and other companies advised by the Government of Mexico.

The two most important elements of the proposed project to ensure the sustainability of ODS waste management activities are:

1.1 Utilization of the Carbon Market:

According to decision XX/7 adopted by the Parties to the Montreal Protocol the project is using the carbon market to leverage seed funding from the MLF. The analysis in Annex I of the proposal explains in detail which carbon markets resp. regulations/standards accept the creation of carbon credits through the destruction of ODS. It also shows that the Climate Action Reserve (*Article 5 Ozone Depleting Substances Project Protocol*[1] *Destruction of Article 5 Ozone Depleting Substances Banks Version 1.0*) currently provides the most suitable methodology to calculate, monitor and verify emission reductions achieved through the destruction of refrigerant ODS (CFC-12 in the project case) from Article 5 countries[2]. The methodology being developed under VCS (see Annex I) will be used for creating credits from destruction of CFC-11 contained in foams. The two main differences between CAR and VCS are that VCS allows destruction in the project host country (Mexico) (while CAR requires destruction in the United States) and VCS also covers the destruction of CFC-11 contained in foams in Mexico (while CAR covers only refrigerant gases in Article 5 countries)

Assuming a rather conservative price of USD 3 per ton of CO2e (either CRT or VCU) and emission reductions of approximately 1,800,000 CO2e, the activities of the first two years will generate a financial value of around 5.4 Mio USD through utilization of the carbon market. This financial benefit will be used as o incentives for further ODS waste management and destruction activities for additional 10 years which will lead to another estimated destruction of 900 ODP tons of CFC-11 and CFC-12. (Please NOTE: there is no funding requested from the MLF for this 2nd part of the project).

The (2) modification/improvement of Mexican legislation is considered as another important element of the proposed demonstration project to ensure the creation of a sustainable and transparent ODS waste management system. The proposed changes shall include:

1. Ban on venting of ODS and on deposition of ODS containing products (wastes) in landfills
2. Defining and assigning the responsibility for financing recycling programs (e.g. either local authorities, power utilities [as current status of voluntary schemes in Mexico] or producer responsibility programs)
3. Requirement that the applied recycling technology achieves an acceptable amount of ODS recovery

The project complies with the criteria established by Decision 58/19 including focus on specific aspects not addressed by other pilot projects.

This project is unique and innovative in its approach because it demonstrates for the first time

a. Funds from MLF may not only be used for a one time destruction of ODS but will provide a type of "seed money" for implementing a sustainable, comprehensive ODS waste management and destruction system in Mexico for the next 12 years. If the business model is proven to be viable any lessons learned regarding the application of carbon markets and the introduction of producer responsibility programs could likely be modified and transferred to other countries where collection activities have already been carried out,

b. The sourcing of co-funding from the carbon market as proposed by the Report by the Secretariat on funding opportunities for the management and destruction of banks of ozone-depleting substances (UNEP 2009),

c. The implementation of advanced environmental policies (such as ban on venting of ODS, defining responsibility for financing recycling programs) which support the establishment of the business model for ODS waste management,

d. The implementation and operation of state of the art recovery and collection technologies in an article 5 country enabling a dramatic increase of ODS collection and destruction efficiency and thereby significantly

[1] Under CAR the term "Protocol" means the "methodology" to calculate and monitor emission reductions as well as to assess additionality of projects.

[2] The Climate Action Reserve Protocol (*Article 5 Ozone Depleting Substances Project Protocol Destruction of Article 5 Ozone Depleting Substances Banks Version 1)* does not yet cover destruction of ODS contained in foams for Article 5 Countries

reducing the impact on the ozone layer as well as on the global climate. Assuming an annual throughput of 200,000 fridges UNIDO expects the yearly collection and destruction of approximately 26 tons of CFC-12 and 64 tons of CFC-11,

e. The extraction and destruction of CFC-11 from insulation foams. Until now almost only ODS refrigerants have been recovered in the Mexican refrigerator replacement programs. The recovery of CFC-11 from insulation foams would be the next step for setting up an advanced waste management system for ODS. The project could provide extremely valuable "real life" data about the amount of CFC-11 contained in insulation foams of refrigerators,

f. The continuous tracking of ODS movements as well as detailed monitoring of ODS point of origin, collection, aggregation, storage, transport and destruction. The project will explore destruction facilities in the US (CFC-12 according to CAR) as well as within in Mexico (CFC-11 according to VCS). Carbon standards require an exact monitoring of quantity and detailed composition of ODS destroyed. Destruction facilities must meet requirements of TEAP *Report of the Task Force on Destruction Technologies* and the *Code of Good Housekeeping*.,

g. The project can build on an well established energy efficiency strategy in Mexico through which around 2.2 million domestic refrigerators and air conditioners will be collected by the end of 2012 (started in 2005) and from which over 100 tons of ODS have been collected for destruction. By providing a clear strategy for the beneficial destruction of ODS further energy efficient programs are will be incentives.

UNIDO strongly believes that this project proposal is a real opportunity to demonstrate to Article 5 countries, that ODS destruction could be self-sustained and moreover self-financed through the commercialization of carbon credits. The results of this demonstration project can be replicated in other Article 5 countries.

2 Justification for the ODS Disposal Pilot Project

2.1 Updated and more detailed information on all issues that were required for obtaining project preparation funding

The Executive Committee, at its 58th Meeting approved a set of interim guidelines for the funding of demonstration projects for the disposal of ODS in accordance with paragraph 2 of decision XX/7 of the Meeting of the Parties. The following information is provided to comply with all the requirements as set out by the above mentioned Decision 58/19

i. An indication of the category or categories of activities for the disposal of ODS (collection, transport, storage, destruction), which will be included in the project proposal

The project includes all categories of activities for the disposal of ODS namely collection, transport, storage and destruction, however it only seeks funding from the MLF for the later three activities in relation to the existing stock of 166.7 tons of ODS (CFC-12 and CFC-11) as described in (iv) in line with the interim guidelines for the funding of demonstration projects for the disposal of ODS.

All collection activities will be financed through the innovative use of carbon markets.

ii. An indication of whether disposal programmes for chemicals related to other multilateral environmental agreements are presently ongoing in the country or planned for the near future, and whether synergies would be possible

ELAP in cooperation with the Secretariat of Energy, SENER and this project is expected to result in early retirement of 1.5 million domestic refrigerators over the next 4 years. However, this demonstration project is be able to recycle such a quantity of the early retired refrigerators.

A World Bank project, is aimed to study the market conditions for the disposal of ODS recovered from residential refrigerators and air conditioners in Mexico,. The program provides rebates to consumers for their older, inefficient appliances. The rebates are used to offset the cost of newer, more efficient models. The appliance take-back program is being coordinated by the Secretaria de Energia (SENER) and currently operated by the Fideicomiso

para el Ahorro de Energía Electrica (FIDE), the Trust for Electric Energy Saving3, with technical support from the World Bank. Financing for the program is being provided in part by the Kyoto Protocol Clean Development Mechanism.

iii. An estimate of the amount of each ODS that is meant to be handled within the project

The Mexican Ministry of Environment and Natural Resources (SEMARNAT) confirmed the already collected amount of CFC-12 of 119.7 MT before 2010 and additional estimate of CFC-12 to be collected in 2010 as 40 MT of old refrigerators and air-conditioners and 7.0 MT from chillers. Table 1: Overview of ODS Already Collected

Batch	Description	CFC-12 collection
1	ODS Surplus collected between 2007-2009	119.7*
2	ODS Surplus to be collected in 2010 year	40.0 **
3	ODS surplus to be collect from Chillers	7.0***
	Total	166.7

*/Considering other stocks from DuPont (15.0 tons more), 6.0 tons from Polimyd company (stocked in Quimobásicos facilities); more tons recovered and reported through the SISSAO system from the R/R centers and scrapping centers (FIDE programme), the quantity of ODS collected from 2007- 2009 could be of the value of 119.7 MT.
**/ SEMARNAT is considering 40.0 MT of ODS that could be recovered in the scrapping and R/R centers in 2010 and 7.0 MT from chillers.
***/ Some of the chillers would provide not more than 7.0 MT of CFC-12 including 3.0 MT from Mexichem Derivados S.A. de C.V., Coatzacoalcos Plant, Veracruz and 4.0 MT from social security hospitals

The expected amount of CFC-12 for incineration for the first two years of the project is estimated to be 166.7 MT.

The expected amount of CFC-12 and CFC-11 for the following 10 years is calculated as follows:

As mentioned above a state of the art technology for de-manufacturing refrigerators and/or air conditioners will be set up (For a detailed description of the technology, see Annex III). The plant will consist of three so called step 1 units, inter alia extracting the ODS refrigerant from the cooling system and one so called step 2 unit which is designed to shred cooling appliances, separate the different materials of the appliance casings while recovering around 90% of the ODS blowing agent contained in the insulating foam.

Assumptions:

Plant Input	200,000 fridges/annum
Recovery of CFC-12 from cooling system	130g/fridge on average
Recovery of CFC-11 from insulation foam	320g/fridge on average

These assumptions would result in annual ODP reduction potential of 90 ODP MT out of which CFC-12 will be approximately 26 ODP MT and CFC-11 will be 64 ODP MT.

iv. The basis for the estimate of the amount of ODS; this estimate should be based on known existing stocks already collected, or collection efforts already at a very advanced and well-documented stage of being set up

As mentioned in iii above, around 166.7 tons of ODS have already been recovered and are currently stored in Mexico. SEMARNAT has confirmed this number. Additional 900 tons are expected to be recovered through the advanced ODS waste management system (as described under iii as well),

v. For collection activities, information regarding existing or near-future, credible collection efforts and programmes that are at an advanced stage of being set up and to which activities under this project would relate.

[3] FIDE is a private non-profit organization, founded with the goal to promote rational electric energy use and energy saving. Its technical Committee includes electric utilities, industry associations and CONUEE, which is Mexico's National Commission on Energy Saving, a technical arm of SENER.

Energy costs are high in Mexico, and the cost of electricity is a major factor in the purchase of a new domestic refrigerator and AC unit. The Mexican government, through the National Electric Commission (CFE, the official energy provider), has been promoting the sale of new AC and refrigeration units equipped with energy saving devices for many years.

A very successful incentive program for retirement of old domestic refrigeration and air conditioning equipment was organized in 2005 by the Fund for Energy Savings (FIDE). This program has accelerated the replacement of old appliances, resulting in reductions of the use of CFCs, since the new equipment is free of CFC and thus the release of CFCs in the service sector has continuously been reduced. 604,000 domestic refrigerators and 126,000 air conditioners have been replaced and destroyed. 22 tons CFC-12 from old refrigerators (36 g per one refrigerator as an average) and 88 tons of HCFC-22 from old air conditioners have been recovered.

In 2007-8 the national recovery and recycling network was enhanced using FIDE's current infrastructure, made available under the NPP, as well as through some new recovery centers. For this purpose, 14 regions covering the country and managing the program using a regional approach were selected. 98 centers were equipped in 2007/2008 with recovery equipment for refrigerants recovery from old appliances that were dismantled in these centers

Mexico's Department of Energy has established a Mexican standard (NOM) that indicates that all new AC and refrigeration units produced in or imported into Mexico must contain energy saving devices.

End-of-life fridges collected for de-manufacturing in Mexico

In 2009 the Mexican Government through the Secretariat of Energy established another very ambitious program of further substituting domestic refrigerators and with a goal of 1,600,000 pieces to be collected until 2012. Under this scheme, the Government offers to Mexican residents low-interest financing and a cash rebate of up to 50% of the cost of a new, energy-efficient refrigerator, when an old fridge is turned in for recycling. The re-payment is made together with the electric energy bill as a low interest rate loan. Major retailers of new appliances - including Wal-Mart and Sears - deliver the new appliance to the customer and collect the old unit for recycling.

While this programs have been a big success in terms of energy efficiency and collection of ODS (166.7 tons) recovery efficiency of ODS continues to be very low (36g per fridge on average) and insulation foam containing CFC-11 is still sent to landfills where harmful ODP and GHG are released into the atmosphere.

Therefore, the UNIDO demonstration project on ODS destruction will concentrate on extraction of CFC-12 from the compressor circuit, separation of oil from the gas, cleaning of the gas to remove all the residues to prepare the gas for incineration and its further liquefaction for transportation to any incineration plant. Further PUR foam panels from refrigerators and air conditioners will be shredded in a shredding plant and CFC-11 as a blowing agent will be extracted under vacuum and collected through the activated carbon filter, then liquefied for its further incineration. The project provides the best-available-technology for CFC-12 and CFC-11 extraction

vi. For activities that focus at least partially on CTC or halon, an explanation of how this project might have an important demonstration value

This project will focus exclusively on the destruction of contaminated CFCs, no CTC or halon will be involved in this pilot project.

3 Detailed information on issues required for project submission

Beneficiaries of the Project

The largest scrapping company in Mexico is *Diagnostico y Administracion de Logistica Inversa SA de CV* (DALI) which was created in 2007. It is based in San Luis Potosi, S.L.P. Mexico. Currently it employs over 110 people throughout the country. DALI has the required personnel, established procedures, and equipment to carry out energy efficiency and environmentally-oriented management programs. Among DALI's shareholders are Appliance Recycling Centers of America Inc. (ARCA), Servicios de Administración en Programas Productivos S.A. de C.V. and Three Flags Trading and Management Inc. DALI operates 44 centres in Mexico under its brand, specialized in collection of used household appliances using five processes and materials recovery centres and two material deposit sites. DALI has partnerships and services contracts with several specialized service providers in the industry like MABE Mexico, S.R.L. de C.V. and L.G. Electronics Mexico. DALI has recycled over 150,000 appliances.

Ecofrigo S.A. is another group of companies dedicated to promoting sustainable environmental technologies in Mexico. Ecofrigo has two centres for collection and destruction of refrigerators and air conditioners (Mexico City and Michoacan) and other tow collection centres (San Luis Potosi and Michoacan). The company is planning under the frame work of the UNIDO project to open five new collection centres in 2010. Ecofrigo is also operational under the Refrigerator Replacement Program SENER-FIDE and cooperates with Walmart, Comercial Mexicana, Elektra, Famsa, Copel, Chedraguy, Soriana, Dose, Angel Furniture and Coca Cola Bottling, Mexico as well as with local air-conditioners producers.

Ecofrigo's premises to accommodate the project equipment

These two companies, i.e., Diagnostico y Administracion de Logistica Inversa SA de CV (DALI) and Ecofrigo S.A. have established an infrastructure and collection network for handling of CFC-12 gas extraction, its confinement and final destruction. They fulfilled the reception activities, recovery of the refrigerant gas (only CFC-12), its storage and the shipment of gas to their final disposal place. They issued official documents for all recyclable materials such as copper, aluminum or other materials for their further processing. The CFC-12 gas recovered by these two companies was used only for refrigerators servicing. No CFC-12 incineration practices were introduced in Mexico.

It was agreed with SEMARNAT that DALI and Ecofrigo and other Mexican recycling companies could establish a joint venture – which will be the project counterparty. The joint venture will be responsible for the extraction and subsequent destruction in of, CFC-12 and CFC-11 of old fridges and ACs. UNIDO strongly believes that this project contributes indeed considerably to the improvement of performance of the network of 98 scrapping companies by providing to them assistance in proper extracting refrigerants and blowing agents.

3.1 Sustainability of the Business Model

The business model of the proposed project is based on leveraging the injected seed money through the use of the carbon market. As described in detail in Annex I various national/regional and international markets for carbon credits have developed over the past few years and have created demand for emission reductions from ODS destruction projects. Just recently by the end of 2010 US State of California announced the introduction of a state wide cap and trade system which also allows the use of offsets from ODS destruction projects (in the first step only from US sourced projects, however it is very widely assumed that also international offsets especially from Mexico will be accepted in the near future).

Even when assuming a rather conservative price per carbon credit of USD 3/tCO2e the simplified cash flow analysis (see section 4) shows that this project is financially viable over the proposed period of time. Funds from MLF will not only be used for a one time destruction of ODS but will provide a kind of "seed money" for implementing a sustainable, comprehensive ODS waste management and destruction system in Mexico for the next 12 years

3.2 Time Critical Elements of the Implementation

Year 1 (time critical output is the destruction of ODS and commercialization of first carbon credits in order to receive the funding for activities not funded by MLF)

- Aggregation of already collected ODS at central facility/ storage
- Transportation of ODS to US
- Destruction of ODS
- Monitoring of ODS destruction according to CAR
- Documentation according to CAR
- Verification
- Sale of carbon credits

Year 2 (time critical output is the procurement specification of equipment, implementation of supportive policies/legislation)

- Activities as mentioned under year 1
- Issuing of policies/norms
- Equipment specification for step 1 and step 2 plant
- Equipment procurement

Activities in year 3-12 are not expected to be as time critical as activities in year 1 and year 2.

As indicated above the other source of funding will be the carbon market (see Annex I for detailed elaboration of the carbon markets to be applied to the project). The following table provides an overview of prices for GHG emission reductions for 2009.

US offset prices 2009

(Carbon Market Analyst-North America, Point Carbon Research, March, 2010)

Table 2: Overview Market Prices per VER

	2009	CAR	VCS
Average mid-market price, US$/tCO^{2}e	1st Q	$7.3	$5.0
	2nd Q	$6.0	$4.6
	3rd Q	$5.1	$3.9
	4th Q	$5.2	$2.9

UNIDO assumes a conservative price of USD 3.0/tCO2e for calculations of income from the carbon markets.

Both carbon standards mentioned under (iii) imply a rigorous monitoring and independent verification of actual amount of ODS destroyed and associated emission reductions.

The Monitoring Plan will be established for all monitoring, operations and reporting activities associated with this ODS destruction project. It will stipulate the

- frequency of data collection
- a record keeping plan
- the role of individuals performing each specific monitoring and operational activity
- QA/QC provisions to ensure that operations, data acquisition and ODS analyses are carried out consistently and with precision.
- data management systems and coordination of data between ODS aggregators, project developers, and destruction facilities.

In relation to the origin of recovered ODS the Beneficiary is responsible for collecting data on the point of origin for each quantity of ODS, as defined in the next table:

Table 6.1. Identification of Point of Origin

ODS	Point of Origin
1. Virgin stockpiles	Location of stockpile
2. Used ODS stockpiled greater than 12 months	Location of stockpile
3. Used ODS quantities less than 500 lbs, and collected in the last 12 months	Location where ODS is first aggregated to greater than 500 lbs[a]
4. Used ODS quantities greater than 500 lbs, and collected in the last 12 months	Site of installation from which ODS is removed

[a] The point of origin for ODS collected by service technicians in individual quantities less than 500 pounds is defined as the holding facility at which several small quantities were combined and exceeded 500 pounds in aggregate. That is, those handling quantities less than 500 pounds need not provide documentation. However, once smaller quantities are aggregated and exceed 500 pounds collectively, tracking will be required from that location and point in time forward.

All data must be generated *at the time of collection* from the point of origin. Documentation of the point of origin of ODS shall include the following:

- Address of point of origin
- Identification of the system by serial number, if available, or description, location, and function, if serial number is unavailable (for quantities greater than 500 pounds)
- Serial or ID number of containers used for storage and transport

In conjunction with establishing the point of origin and importation process for each quantity of ODS, the Beneficiary must also document the custody and ownership of ODS. These records shall include names, addresses, and contact information of persons buying/selling the material for destruction and the quantity of the material (the combined mass of refrigerant and contaminants) bought/sold.

The transfer of custody may be established using the following documentation, as appropriate:

- Tax ID, or other applicable identifier, of transferor and transferee
- Bill of lading (where appropriate)

- Date of transfer of custody
- Serial or ID numbers of all containers containing ODS (received and delivered)
- Weight of all containers containing ODS (received and delivered)
- Distance and mode of transportation used to move ODS (truck, rail or air)

The verification body will review these records and will perform other tests necessary to authenticate the previous owners of the material and the physical transfer of the product and the title transfer of ownership to the Beneficiary. No GHG credits may be issued under this protocol for ODS where ownership cannot be established.

Prior to destruction the precise mass and composition of ODS to be destroyed must be determined according to a very detailed procedure as outlined in the CAR Protocol *Article 5 Ozone Depleting Substances Project Protocol Destruction of Article 5 Ozone Depleting Substances Banks Version 1.0.*

Destruction Facility Requirements
VCS as well as CAR require that all ODS be destroyed at a destruction facility that is compliant with both the international standards specified in the TEAP *Report of the Task Force on Destruction Technologies* and Code of Good Housekeeping, (and in the case that destruction will take place in the US the requirements of domestic U.S. law).

Data shall be provided to the independent verification body (independent certification body such as DNV, SGS TUEV etc. accredited under CAR and/or VCS) to demonstrate that during the destruction process, the destruction unit was operating similarly to the period in which the DRE was calculated.

To monitor that the destruction facility operates in accordance with applicable regulations and within the parameters recorded during DRE testing, the following parameters must be tracked continuously during the entire ODS destruction process:

- The ODS feed rate
- The amount and type of consumables used in the process (not required if default project emission factor for transportation and destruction is used)
- The amount of electricity and amount and type of fuel consumed by the destruction unit (not required if default project emission factor for transportation and destruction is used)
- Operating temperature and pressure of the destruction unit during ODS destruction
- Effluent discharges measured in terms of water and pH levels
- Continuous emissions monitoring system (CEMS) data on the emissions of carbon monoxide during ODS destruction

The beneficiary must maintain records of all these parameters for review during the verification process. Destruction facilities shall provide a valid Certificate of Destruction for all ODS destroyed. The Certificate of Destruction shall include:

- Project developer
- Destruction facility
- Generator name
- Certificate of Destruction ID number
- Serial, tracking, or ID Number of all containers for which ODS destruction occurred
- Owner of destroyed ODS
- Weight of material destroyed from each container
- Start destruction date
- Ending destruction date

3.3 Project Schedule:

Investment Component

The investment component of the project will focus on the fact that the project is only for demonstration, but to keep open the possibility to continue the activities, which have proved to be effective and economical. It consists of the following elements:

- Assessment of the technical requirements of conversion of the equipment available
- Determining the scope of international and local procurement
- Development of technical specifications and terms of reference for procurement
- Pre-qualification and short-listing of vendors
- International/local competitive bidding
- Procurement contracts
- Site preparation
- Customs clearance and delivery
- Installation and start-up
- Product and process trials
- Operator training
- Commissioning and start up

This approach draws on previous implementation experience and has been designed based on the size, level of organization, location and customer base of enterprises concerned and also based on ease and convenience for execution and management. Given the small and medium to large size of the enterprises involved, the need for adequate investments for Plant and process changes, supported by investments on adequate technical assistance, trials and training, is critical and will involve significant inputs.

Project and Process Investments

UNIDO will ensure the installation of modern and appropriate technologies that are best adapted to the needs of the given destruction problems. The specification of the de-manufacturing as well as the mobile plasma arc destruction facility shall ensure protection of workers and the environment. In case of leasing the de-manufacturing facility for the separation of CFCs from the collected end-of-life domestic refrigerators, the collection efficiency for the CFCs and the efficient separation of the construction materials are the two main aims that determine the technical specification.

Product and Process Trials

Trials will be required to validate the new equipment as well as the production process using the new technology, specifically to establish their performance and suitability for the separation and destruction efficiency according to the specifications and project objectives. Trial costs will cover the cost of chemicals, components, consumables and utilities required during site preparation and commissioning, as well as the cost of the operators.

Technical Support Component

The project will address not only the destruction as an only subject, because the environmental and economic benefit mainly depends on successful marketing of the recovered construction materials (steel, plastics, rubber, aluminium, glass, etc.). These activities will need to be supported through provision of a technical support component for ensuring that the collection of the high volume many thousand tonnes of recovered material could be sold. This should be consistent with the recycle priorities of the Government.

Technical Support Component Actions

The Technical Support Component will:

a) Establish quality standards for the recovered construction materials using data and information from the de-manufacturing equipment supplier.

b) Conduct one workshop to ensure a high level of professional technical assistance in the fields of health and safety and for protection of the environment for technicians who are working in the collection of end-of-life refrigerator. The workshop goal is to ensure a high level of assistance in the fields of health and safety and for protection of the environment.

Policy and Management Support Component

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 the Government priorities.

The demonstration project will be managed by a dedicated management committee, consisting of a coordinator to be designated by the Government and supported by representatives and experts from the implementing/executing agency and the necessary support infrastructure. The management support component of the project will include the following activities for the duration of the project:

a) Management and co-ordination of the project implementation with the various Government policy actions
b) Establishment of a policy development and enforcement program, covering various legislative, regulatory, incentive, disincentive and punitive actions to enable the Government to acquire and exercise the required mandates in order to ensure compliance by the industry
c) Development and implementation of 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.
d) Creation of awareness of the Project and the Government initiatives in the sector among consumers and public, through workshops, media publicity and other information dissemination measures
e) Preparation of an implementation plan including determining the sequence of enterprise participation in planned sub-projects
f) Verification and certification of results of the demonstration project completed through visiting and performance auditing
g) Establishment and operation of a reporting system for collected refrigerators, end-of-life separated CFCs.

Co Financing will be arranged with the Beneficiary of the project

The counterpart contributes funds in kind (premises, labour, lab equipment, CFC collection expenses, etc.)

4 Project Costs

The following table gives an overview of total annual costs related to the implementation of the proposed project:

Table 3: Overview: Total Annual Project Costs

			Years											
	USD	Units	1	2	3	4	5	6	7	8	9	10	11	12
Project Output														
Collected ODS CFC-12		tCFC-12	83	83										
ODS Collection CFC-12		tCFC-12			26	26	26	26	26	26	26	26	26	26
ODS Collection CFC-11		tCFC-11			64	64	64	64	64	64	64	64	64	64
Associated Emission Redcutions (according to CAR and VCS)														
Collected ODS (CFC-12)		tCO2e	907,890	907,890										
ODS Collection CFC-12		tCO2e			283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205
ODS Collection CFC-11		tCO2e			98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248
Costs														
Investment Stage I CFC-12 Three Recovery Units with Separation of Oil and Gas				900,000										
Investment Stage II CFC-11 one Extraction and Liquefaction Plant					4,000,000									
Investment three ISO Containers (10000 Litres)			60,000											
(ODS Sourcing) Buying Collected ODS CFC-12	4.0	USD/kgCFC-12	333,400	333,400										
Operating Costs De-Manufatcuring (Energy,Wages)					110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400
Transportation of Dispersed ODS within Mexico to Centralized Facility to Aggregate in ISO Containers for Transport to the US			10,000	10,000										
Transportation of Aggregated CFC-12 to US Destruction Facility (e.g. Clean Harbors El Dorado, Arkansas) 17 times			51,000	51,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Transportation of Collected Fridges Mex.					2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Transportation of CFC-11 to Mexican Desruction Facility					800	800	800	800	800	800	800	800	800	800
CFC-12 Destruction (Incineration) Costs US	5.5	USD/kgCFC-12	458,425	458,425	143,000	143,000	143,000	143,000	143,000	143,000	143,000	143,000	143,000	143,000
CFC-11 Destruction (Incineratio) Costs Mex.	3.0	USD/kgCFC-11			192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000
Monitoring & Verification (ODS Destruction)			40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Transaction Fee Carbon Registries	0.2	USD/tCO2e	181,578	181,578	56,641	56,641	56,641	56,641	56,641	56,641	56,641	56,641	56,641	56,641
Carbon Market Project Management (Documentation, Sale etc.)			115,000		115,000									
Health, Safety, Environment Training			30,000											
Policy Support (Management USD 50,000, Dissemination 45,000)				95,000										
Total Costs			**1,279,403**	**2,069,403**	**4,671,841**	**556,841**	**556,841**	**556,841**	**556,841**	**556,841**	**556,841**	**556,841**	**556,841**	**556,841**

The following information sources were used to make assumptions:

Investment Stage I CFC-12 (3 units)	information by manufacturer
Investment Stage II CFC-11	information by manufacturer
Investment 3 ISO Containers	information by logistics experts
Buying Collected CFC-12	information by local experts
Operating Costs (Energy, Wages)	information by manufacturer
Transportation of dispersed ODS within Mexico	own assumptions
Transportation of Aggregated ODS to US	information by logistics experts
Transportation of Collected Fridges within Mexico	own assumptions
CFC-12 Destruction US	information by destruction facility
CFC-11 Destruction Mexico	own assumption
Monitoring and Verification ODS Destruction	information by carbon market expert
Transaction Fee Carbon Registries	information by Climate Action Reserve
Carbon Market Project Management	information by carbon market expert
Health, Safety, Environment Training	own assumption
Policy Support	own assumption

The following table provides an overview of the total Incremental (Capital) Costs/Investment Component of the full size project

Table 4: Incremental Costs Full Size Project

Activity	Full Scale Project Cost USD
Investment Cost	
Centralized Facility for ODS Collection at the Beneficiary Site	
Stage I CFC-12 Three Recovery Units with Separation of Oil and Gas	900,000
Stage II CFC-11 One Extraction and Liquefaction Plant	4,000,000
Three ISO Containers (10000 Litres)	60,000
Contingency 10%	496,000
Sub-total	*5,456,000*
Policy Management Support	
Eligible part of Management, Coordination and Monitoring, Communication and Transportation including the Improvement/Upgrade of Local Legislation including the First Stakeholder Meeting	50,000
One Workshop in the First Year for Public Awareness and One Workshop in 2011 for Information Dissemination	45,000
Contingency 10%	9,500
Sub-total	*104,500*
Technical Component	
Carbon Market Project Management (Documentation, Sale etc.)	230,000
Health, Safety, Environment Training (Technical Workshop with International Expert)	30,000
Contingency 10%	26,000
Sub-total	*286,000*
Incremental Operating Costs	
Transaction Fee Carbon Registries	929,566
Monitoring and Verification of ODS Destruction	480,000
Collection ODS CFC-12	666,800
Operating Costs De-Manufacturing (Energy, Wages)	1,104,000
Transportation of Dispersed ODS within Mexico to Centralized Facility to Aggregate in ISO Containers for Transport to the US	20,000
Transportation of Aggregated CFC-12 to US Destruction Facility (e.g. Clean Harbors El Dorado, Arkansas)	222,000
Transportation of Collected Fridges Mex.	20,000
Transportation of CFC-11 to Mexican Destruction Facility	8,000
CFC-12 Destruction (Incineration) Costs US	2,346,850
CFC-11 Destruction (Incineration) Costs Mex.	1,920,000
10% Contingency	771,722
Sub-total	*8,488,938*
Total Incremental Costs Full Size Project	**14,335,438**

Activities to be funded by the MLF

The following table gives an overview of the activities or costs to be funded by the MLF

Table 5: Activities to be funded by the MLF

Activity	Number of Units	USD/Unit	Cost
Transportation of Dispersed ODS within Mexico to Centralized Facility to Aggregate in ISO Containers for Transport to US	1	20,000	20,000
ISO Container (10,000 Litres)	3	20,000	60,000
Transport of Aggregated CFC-12 to US Destruction Facility (e.g. Clean Harbors El Dorado, Arkansas)	27	6023	162,618
Destruction of CFC-12 Already Collected by Existing Energy Efficient Appliances Replacement Programs in Mexico	166700	5.5	916,850
Monitoring and Verification of ODS Destruction	2	40,000	80,000
Carbon Market Project Management (International Experts)	7 w/m	115,000	115,000
Health Safety Environment Training	1	30,000	30,000
Contingencies 10% (of total costs)			138,447
Total			1,522,915

Total costs to be requested funding for from MLF are 1,522,915 USD.

The following table gives an overview of the total annual income generated by the project

Table 6: Total Annual Income Generated by the Project

			Years											
	USD	Units	1	2	3	4	5	6	7	8	9	10	11	12
Project Output														
Collected ODS CFC-12		tCFC-12	83	83										
ODS Collection CFC-12		tCFC-12			26	26	26	26	26	26	26	26	26	26
ODS Collection CFC-11		tCFC-11			64	64	64	64	64	64	64	64	64	64
Associated Emission Redcutions (according to CAR and VCS)														
Collected ODS (CFC-12)		tCO2e	907,890	907,890										
ODS Collection CFC-12		tCO2e			283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205	283,205
ODS Collection CFC-11		tCO2e			98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248	98,248
Income														
Sales Collected CFC-12	3.0	USD/tCO2e	2,723,670	2,723,670										
Sales ODS Collection CFC-12	3.0	USD/tCO2e			849,615	849,615	849,615	849,615	849,615	849,615	849,615	849,615	849,615	849,615
Sales ODS Collection CFC-11	3.0	USD/tCO2e			294,744	294,744	294,744	294,744	294,744	294,744	294,744	294,744	294,744	294,744
Total Income Carbon Market			**2,723,670**	**2,723,670**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**	**1,144,359**

The following information sources were used to make assumptions:

Already Collected ODS CFC-12	please refer to section 2.1
ODS Collection CFC-12 (Additional 10 years)	please refer to section 2.1
ODS Collection CFC-11 (Additional 10 years)	please refer to section 2.1
Associated Emission Reductions	estimation based on CAR and VCS meth.
Price per Emission Reduction (CO2e)	please refer to section 3

The funds provided by the MLF can therefore be paid back by the income generated through the utilization of the carbon market.

5 Implementation Schedule First 2 Years

Table 7: Implementation Schedule First 2 Years

	Months												Months											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Tasks																								
MLF Approval and Funding																								
Financial Appraisal																								
Sub-grant agreement																								
Aggregation of Already Collected ODS in Centralized																								
Transportation of Already Collected ODS to the USA																								
Destruction of ODS																								
CAR/VCS Project Development																								
Monitoring of ODS Destruction According to the CAR																								
Verification and Issuance of Carbon Credits																								
Change of Regulation																								
Commercialization of Carbon Credits																								
Issuing Norms																								
Workshops																								
Equipment specifition - Stage 1																								
Equipment procurement - Stage 1																								
Equipment specification - Stage 2																								
Equipment procurement - Stage 2																								

6 Annex I Linkage between the Montreal Protocol and the Carbon Market

6.1 Overview of GHG Markets

By implementing the **Kyoto Protocol** and its flexible mechanisms (article 6 Joint Implementation = **JI**, article 12 Clean Development Mechanism = **CDM** and article 17 International Emissions Trading = **IET**) for the first time a market for greenhouse gas (GHG) emission reductions was established[4]. While JI/CDM are project based mechanisms (**crediting system,** meaning that credits are only issued after emissions have been reduced) the IET is classified as a **cap and trade system** (where a central authority issues "allowances" which can be sold and bought immediately after issuance; emission reductions are occurring if the central authority issues less allowances than required by market participants under business as usual scenarios)

Additionally to the carbon market created by the Kyoto Protocol several countries or **regional initiatives have established (compliance) emission trading systems** (e.g. EU ETS, New Zealand etc.) including energy intensive corporations (primarily power companies and heavy industry). Units traded in those systems are usually similar in their nature (presenting 1 ton of CO2e) and structure (allowances allocated through an authority versus carbon credits/offsets from specific projects). However they often differ in their requirements for quality and project categories[5].

[4] Often also referred to as carbon market since the general unit traded is 1 ton of CO2-equivalents (other types of GHG emissions such as CH4 or HFC-23 are converted into 1 ton of CO2e; E.G. 1 ton HFC equals 11700 tons of CO2e)

[5] E.G. The EU recently stopped the inflow of carbon credits from HFC-23 and N2O (from adipic acid production) CDM projects by May 2013, while New Zealand may still allow them (but is also discussing a restriction)

Info box 1 provides an overview of the most common carbon markets and units traded:

Units defined by the Kyoto Protocol:
– Assigned Amount Units (AAUs)
– Certified Emission Reductions (CERs)
– Emission Reduction Units (ERUs)
– Removal Units (RMUs)

• **Units defined by EU and national legislation:**
– EU Allowances
– UK Allowances and Credits
– Australian Abatement Certificates and Sequestration Rights
– US SOx and NOx Allowances, Regional Greenhouse Gas Initiatives
– Other

• **Units defined by contracts and non governmental regulated standards:**
– Verified Emission Reductions (VERs)

Besides the so called **"compliance markets"** a market for verified or voluntary emission reductions units[6] has developed over the past few years. The **"voluntary market"** defines its units through contracts and non-governmental regulated standards (see footnote below for examples). VERs are mainly bought by private persons (to offset their carbon footprint) or companies not covered by any compliance regime in their Corporate Social Responsibility (CSR) programs. This said it is natural that VERs usually achieve lower prices than units traded in compliance carbon markets[7].

Table 8 shows the dominant role of the EU ETS in the global arena with a market value in 2009 of 118,474 Mio USD, but even the market for voluntary emission reductions has a volume of 419 resp. 338 Mio USD in 2008 and 2009.

Table 8: Overview of Carbon Markets (Source: World Bank)

	2008		2009	
	Volume ($MtCO_2e$)	Value (US$ million)	Volume ($MtCO_2e$)	Value (US$ million)
Allowances Markets				
EU ETS	3,093	100,526	6,326	118,474
NSW	31	183	34	117
CCX	69	309	41	50
RGGI	62	198	805	2,179
AAUs	23	276	155	2,003
Subtotal	3,278	101,492	7,362	122,822
Spot & Secondary Kyoto offsets				
Subtotal	1,072	26,277	1,055	17,543
Project-based Transactions				
Primary CDM	404	6,511	211	2,678
JI	25	367	26	354
Voluntary market	57	419	46	338
Subtotal	486	7,297	283	3,370
Total	**4,836**	**135,066**	**8,700**	**143,735**

Subtotals and totals may not exactly add up because of rounding.

[6] In general Verified Emission Reductions (VERs) but specifically in the Voluntary Carbon Standard (VCS) Voluntary Carbon Units (VCUs) are traded under Climate Action Reserve (CAR) Climate Reserve Tons (CRT).
[7] This is not always true, in certain cases prices of units traded in compliance markets have gone virtually to zero if there is high oversupply and if such units cannot be traded on other markets (e.g. EU ETS in 2007)

The following table shows prices of different kind of VERs. While **CRTs** achieved prices of USD 8.8 and 7.1 in 2008 and 2009, **VCUs** could only be sold at prices of USD 5.5 and 4.6 respectively. This difference in prices can mostly be explained by perceptions of market participants that the inclusion of CAR into any compliance emissions trading in the United States would be more probable in the future than the inclusion of VCS projects.

Table 9: Overview of the Nort American Carbon Market (Source: World Bank)

TABLE 2 North American carbon market – traded volumes and values, 2008–09

	Average Price (US$/tCO$_2$e)		Volume (MtCO$_2$e)		Value (million US$)	
	2008	2009	2008	2009	2008	2009
RGGI (Allowances)†	3.9	3.3	61.9	805.2	198.2	2,178.6
Alberta (Offsets/EPCs)	10.0	13.5*	3.4	4.5	33.5	60.8
CCX (CFIs)	4.4	1.2	69.2	41.4	306.7	49.8
Voluntary Offset Market	6.8	4.9	15.4	29.0	104.1	143.4
of which CAR	*8.8*	*7.1*	*5.3*	*14.9*	*46.6*	*104.5*
of which CCX	*4.8*	*0.8*	*1.0*	*7.4*	*4.8*	*5.9*
of which VCS	*5.5*	*4.6*	*1.5*	*3.3*	*8.3*	*15.2*
of which ACR	*3.8*	*3.4*	*4.3*	*1.8*	*16.3*	*6.1*
of which Other	*8.5*	*7.3*	*3.3*	*1.6*	*28.1*	*11.7*
Total market			**149.9**	**880.1**	**642.5**	**2,432.5**

Source: Bloomberg New Energy Finance, Ecosystem Marketplace. Notes: † RGGI includes quarterly auction figures, * Alberta price is an estimate.

6.2 Relation of GHG Markets to the Montreal Protocol (MP)

Many chemicals used as refrigerants and blowing agents not only are depleting the ozone layer (Ozone Depleting Substances = ODS) but are also having a significantly adverse effect on the global climate (Greenhouse Gases =GHGs). While the MP regulates consumption and production of ODS (not disposal) the KP regulates emissions not covered by the MP (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6).

Since most ODS are not included in the "Kyoto basket" of gases **reductions of such ODS cannot (yet) be structured as CDM or JI projects** (Please see info box 2 below for details)

Paragraph 44 of the Modalities and Procedures for the CDM requires that a baseline shall cover emissions from all gases, sectors and source categories listed in Annex A of the Kyoto Protocol within the project boundary.

Paragraph 17 of EB 34 provides guidance on project/leakage emissions of GHGs as defined in paragraph 1 of the Convention but not included in Annex A of the Kyoto Protocol such as GHG gases (e.g., CFCs, HCFCs) covered under the Montreal Protocol.

Hence, claiming emission reductions associated with the replacement of CFC or HCFC refrigerants and blowing agents with no-ODP and low-GWP gases is not eligible in accordance to CDM modalities and procedures.

Paragraph 17 of EB 34:
17. With reference to a proposed methodology, the Board considered the analysis of implication of different options proposed by the Meth Panel with regard to accounting emissions of GHGs and also implications on gases covered under the Montreal Protocol.

The Board agreed that:

(a) The project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases, as defined in paragraph 1 of the Convention but not included in Annex A of the Kyoto Protocol, under the control of the project participants that are significant and reasonably attributable to the CDM project activity.

(b) The leakage emissions from greenhouse gases, as defined in paragraph 1 of the Convention but not included in Annex A of the Kyoto Protocol, should be accounted, if the CDM project activity results in an increase of such emissions.

(c) The global warming potentials used to calculate the carbon dioxide equivalence of anthropogenic emissions by sources of greenhouse gases not listed in Annex A, shall be those accepted by the Intergovernmental Panel on Climate Change in its third assessment report

While the international Kyoto based market cannot uptake any emission reductions generated through the destruction of ODS some voluntary standards as well as regional compliance markets have begun to recognize ODS destruction as a highly verifiable source of GHG reduction credits.

In 2007 the Chicago *CCX Offset Project Protocol: Ozone Depleting Substances Destruction*

On January 25th 2010 the Voluntary Carbon Standard www.v-c-s.org *Extension of Scope to Include Ozone-Depleting Substances* and on May 3rd 2010 the first methodology proposal *"Greenhouse Gas Emission Reductions By Recovering and Destroying Ozone Depleting Substances (ODS) from Products"* was submitted which is currently assessed

On February 3rd 2010 *Article 5 Ozone Depleting Substances Project Protocol Destruction of Article 5 Ozone Depleting Substances Banks Version 1.0* as well as *U.S. Ozone Depleting Substances Project Protocol Destruction of U.S. Ozone Depleting Substances Banks Version 1.0* was accepted by the board.

On December 16th 2010 the California Air Resources Board endorsed the cap-and-trade regulation, marking a significant milestone toward reducing California's greenhouse gas emissions under its AB 32 law. Included in the regulation are four protocols, or systems of rules, covering carbon accounting rules for offset credits in forestry management, urban forestry, dairy methane digesters, *and the destruction of existing banks of ozone-depleting substances in the U.S.* (mostly in the form of refrigerants in older refrigeration and air-conditioning equipment).

As of January 2011, 9 ODS destruction projects are registered under the Climate Action Reserve and around 2.5 mio CRTs have been generated. These developments impressively show the increasing importance of ODS destruction projects as GHG mitigation measure and the relevance of the carbon market to incentives destruction activities.

7 Annex II Background on ODS related Legislation and Policies in Mexico

Mexico used to be the largest CFC and HCFC producing country in Latin America, with a diversified industrial infrastructure and has been consuming a multitude of ODS. Mexico´s obligations under the Montreal Protocol are administered by the Ministry of Environment and Natural Resources SEMARNAT. The main achievement in reducing ODS consumption in Mexico have been so far:

1990: More than 90% reduction in the consumption of chlorofluorocarbons (CFCs), due to the implementation of more than 100 projects for substituting the use of these substances in domestic and commercial refrigerators, air conditioners, aerosol sprays, solvents and polyurethane foams.

1997: All the domestic and commercial refrigerators produced in the country are CFC-free.

2002: Start of the ''Program for the Financing for electric energy saving'' (PFAEE) in which the objective was to back up the Federal Government's Program for electric energy saving and efficient use. In the said program, the creation of Centers for gathering destruction of the out-of-use refrigerators was performed. These centers had the infrastructure for the control of the handling, gas extraction, confinement and destruction of the refrigerators. The aforementioned program was operational until 2006 and involved over 100 Centers, of which it is uncertain if any of them are still active or whether they have the infrastructure to be operational. However, the Mexican authorities informed that after CFC-12 recovery, it was not destroyed. Neither PUR foam panels containing CFC-11 gas.

2005: The Mexican Government made a commitment with the Montreal Protocol to go ahead and close the CFC production plant operated by the Quimobásicos company in Monterrey, Nuevo Leon. The country took this action four years earlier than the date stipulated in the Protocol. This meant that CFC production in North America was

completely phased out, thereby promoting an end to this production not only in Mexico, but in all of Latin America and other regions of the world, thereby reducing total CFC production in the world by 12% and in the hemisphere by 60%. The product was used in refrigerators, air conditioners, aerosol sprays and in the production of polyurethane foams.

2005: 100% elimination of CFC use in the production of polyurethane foams, thereby eliminating the consumption of more than 600 metric tons of these compounds in more than 200 companies in the country.

Mexico has in place very effective ODS legislation and has been complying with all MP control measures. The ODS awareness program reached out to the general public all over the country. The table below summarizes the most important legislation related to ODS.

Table 10: Overview of ODS Related Legislation in Mexico

No.	Regulation	Brief description	Promulgating Agency	Came into force
1	General Law of Environmental Protection and Ecologic Equilibrium	General environmental policy framework		1987
2	Law for Prevention and Control of Climate Change	General strategy for prevention, control and policy evaluation of ODS.		
3	ODS Import/Export Licensing System	Enabling the country to implement an import license system and control procedures for CFCs and CTC, particularly at customs entry points.	Promulgated by Secretariats of Environment, Agriculture and Health	
4	NOM-125-ECOL-2001	Regulatory framework to control the use of ODS in all sectors restrictions over national production and imports of freezers and domestic or commercial air conditioning containing or having been produced with ODSs.		2001
5	Voluntary reporting of trade on CFCs	The national CFC producing enterprises to voluntarily report domestic and international commercial activities such as production, imports and exports volumes	SEMARNAT	1992
6	Justice Codes	Any illegal traffic and mishandling of CFCs is a federal crime		
7	NOM-085-SEMARNAT-1994	Atmospheric contamination – fixed sources. for fixed sources that utilize solid, liquid, or gas combustible fossil fuels, or any of their combinations, that establishes the maximum permissible levels of emission to the atmosphere of smoke, total suspended particulates, sulfur dioxides and nitrogen oxides	SEMARNAT	1994
8	NOM-015-ENER-2002	Energy efficacy of refrigerators sold	Ministry of Energy	2003

8 Annex III Background on Technology Selection

Destruction Facility

VCS as well as CAR require that all ODS be destroyed at a destruction facility that is compliant with both the international standards specified in the TEAP *Report of the Task Force on Destruction Technologies* and *Code of Good Housekeeping*, (and in the case that destruction will take place in the US the requirements of domestic U.S. law).

CFC-12 will probably be destroyed in a facility in the United States.

CFC-11 will either be destroyed in a plasma arc facility or cement kiln or any other appropriate technology financially feasible and in compliance with above mentioned guidelines being confirmed by an independent third party (verification)

De-manufacturing End-of-Life Refrigerators

De-manufacturing 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 the – 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. As a general requirement, the RAL-GZ 728 quality standard of Deutsches Institut für Gütesicherung und Kennzeichnung E. V. may be considered:

Overview of the Technology for De-commissioning end-of-life Domestic Refrigerators and Air-conditioning units

The technology has two well separated steps. The first step is essential to take part as soon as possible after the collection of the refrigerators because 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 fridges 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.

Step 1 - Pre-treatment

Within the scope of Stage 1 pre-treatment, the cooling devices are “dried up”, i.e. the cooling system is completely evacuated by means of an extraction system. The extraction process sequence is as follows:
By means of a hoisting and turning gear, the individual appliances are positioned such that the cooling system can be opened at its lowest point in order to enable full extraction of refrigerating agent and refrigerating oil. Refrigerating agent and refrigerating oil are sucked into a closed system, which is kept at a negative pressure of approx. 300 mbar. Within this closed system, the refrigerating agent is separated from the refrigerating oil and, upon liquefaction, is exported into compressed gas cylinders. Upon complete removal of the refrigerating agent, the refrigerating oil is collected in two tanks integrated into the plant and transferred into suitable drums as soon as a defined tank level is reached.

De-manufacturing compressor circuit unit (CFC-12 extraction)-
CFC-12 extraction from the compressor circuit

The extraction process and the separation of refrigerating agent and refrigerating oil are electronically controlled and monitored to ensure operational safety of the plant at any time. All Stage 1 plant parts are installed on collecting pans, so that liquids escaping during the work process are safely retained. In proper operation of the plant, the treatment process does not give rise to any emissions. Via roller conveyors and an automatic, photocell-controlled charging system, the CFC -containing PUR devices are, on a just-in-time basis, forwarded to the Stage 2 section and processed there. The de-manufacturing capacity of the Step 1 unit is 60-70 fridges per hour, approximately 200,000 fridges per one shift per year. Its cost as advised by SEG De-manufacturing, Germany is US$ 315,000 for two arms manipulator with a capacity of only 20-24 fridges. The cost of three 2 arms manipulators and three CFC-12 extraction units with oil/gas separation with capacity of 60-70 fridges per hour will be about US$ 1.0 million in order to accommodate the primary quantity of 200,000 old fridges per year- project target.

Step 2 – Treatment

After “drying up” of the appliances, the compressors, all wooden and glass parts and all components containing harmful substances, such as capacitors and mercury switches, are removed and collected separately. 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 input into a closed system and shredded there in a 2-stage shredding system; the resulting mixture of materials is then divided up by means of an air separating system. The fraction consisting of scrap steel and iron, plastics and non-ferrous metals is discharged from the system and further divided up into its constituents by means of a magnetic separator and an eddy-current separator system, while the separated PUR foam is ground within the plant and heated up in order to drive out the CFC adhering to the PUR foam. Upon completion of this treatment step, the PUR powder is also discharged from the plant. The insulating gas/blowing agent (CFC) released during the process of shredding, grinding and heating is collected, adsorbed in activated carbon and, following desorption from the activated carbon, liquefied under pressure by means of compressors.

Shredding unit (CFC-11 extraction)

Equipment Specifications to be Advised by the Beneficiary

- Annual capacity: 200 000 pcs of domestic refrigerators in one shift;
- Recycling efficiency: min. 90% meaning that min 90% in weight of the original end-of-life refrigerator is separated in the form of materials, which can be sold;
- Efficiency of recovery of CFCs from cooling circuits and from the insulation foam should be higher than 90% 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.