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

PROJECT PROPOSAL: CUBA

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

Destruction

- Pilot demonstration project on ODS waste management and disposal UNDP

PROJECT DESCRIPTION

Introduction

1. UNDP, on behalf of the Government of Cuba, submitted to the 62nd Meeting a proposal for a pilot demonstration project on ozone depleting substances (ODS) waste management and disposal at a cost of US $792,763 plus agency support costs of US $59,457, as originally submitted. This project is submitted in line with decision 58/19 and will address the destruction of 60.4 metric tonnes (mt) of waste ODS in the country. The Government of Cuba is requesting the approval of this project at the 62nd Meeting.

2. At the 59th Meeting, the Executive Committee provided funds for UNDP to prepare a pilot ODS demonstration project for Cuba. 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 provided 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. Members also stressed that ODS disposal demonstration projects should be feasible, and should include methods of leveraging co-funding. Cuba was one of the countries selected based on this criteria.

Background

3. 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. The review carried out by the Secretariat was based on the principles established through this decision. 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 an annex 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". This pilot project for Cuba will cover already collected ODS as well as additional amounts to be collected under a nationally-funded incentive programme for the retirement of domestic refrigeration and air conditioning equipment to promote energy efficiency.

4. This pilot project seeks to develop an efficient and cost-effective logistic framework for the transport, storage and destruction of ODS in Cuba. The project will address ODS waste that has already been collected and will also firmly establish a system that will allow Cuba to deal with the destruction of ODS waste to be collected in the future as part of the country's *National Total Substitution Programme for High-Energy Consuming, ODS Based Refrigerators and Air Conditioners*. This programme was introduced in 2006 where it promoted the complete substitution of old energy inefficient domestic refrigerators and air-conditioning units. The programme has been actively supported by the National Ozone Unit (NOU) to ensure that unwanted ODS have been properly recovered, following best refrigeration practices. At present, over 2,757 million refrigerators and 276,000 air-conditioning units, on average 20 to 60 years old, have been decommissioned and replaced with energy efficient units at a cost of over US $700 million to the Government of Cuba, which has funded the complete collection, substitution and decommissioning programme. The programme aims to ultimately replace the estimated 3 million domestic refrigerators and 300,000 air-conditioning units in the country' inventory. A detailed project proposal is attached as Annex I to this document.

Project description

5. This pilot project will initially address the disposal of the 60.4 metric tons (mt) of CFC-12 (i.e. 15.1 mt per year for four years) that has already been collected from the National Substitution Programme and is ready for destruction. In addition, it will also look at other components under the national phase-out plan (NPP) that strongly promote the recovery of ODS in Cuba and ensure that the system of

collection is extended to this network as well. It is expected that a total of 133 mt will be destroyed beyond the project life as an initial amount.

6. As indicated in the originally submitted proposal, the project will aim to demonstrate the feasibility and respective advantages and disadvantages of two different destruction technologies (both Japanese) one using a rotary cement kiln as a technical option for destruction and the other using plasma decomposition. Both these technologies have not been tested in the region. The economics and sustainability of ODS destruction in Cuba will be examined in the context of the country`s refrigerator replacement programme. The demonstration project is envisaged to be implemented in four years, after which the government will continue to operate both facilities and ensure that waste streams collected flow directly to these processes for destruction.

7. With regard to the cement kiln, the Government has identified one facility that can be set up as an ODS disposal centre. This facility has four rotary kilns, two of which are proposed to be adapted for this purpose. This is expected to result in a combined destruction capacity of 10.3 mt per year. The proposal also provided information on why rotary cement kilns are a good technical option for destruction of ODS.

8. Both technologies to be tested are expected to result in destruction of ODS waste in line with the accepted destruction rate of 99.99 per cent Destruction and Removal Efficiency (DRE). The test performance of the plasma arc machine has shown a decomposition rate of 99.99 per cent with no dioxin emissions detected.

Estimation of the ODS to be disposed

9. The sources of ODS to be destroyed will mainly come from the currently existing national energy efficiency and refrigerator replacement programme and the national refrigerant recovery programme supported under the NPP. The national substitution programme has collected and dismantled around 2.6 million refrigerators and air conditioning equipment which yielded 48.3 mt of CFCs and 84.8 mt of HCFCs, resulting in a total ODS waste available of 133 mt. These are currently stored in a central storage facility in Havana. A strong network of recovery and recycling has also been set up in Cuba under the NPP, and the country expects to build on this to potentially recover an additional 199 mt of ODS waste. The project envisages the destruction of 15.1 mt per year for four years.

Institutional and financial management of the project

10. The national set-up in Cuba which is controlled by a central government puts it in a unique situation to manage this ODS destruction project. The recovery, collection and destruction of ODS in Cuba will take place in two main phases and will involve three main partners, in the form of central organizations that will be fully responsible for its implementation. The roles of these three main institutions are summarized below:

(a) The Ministry of Science Technology and the Environment through its Technical Ozone Office, is in charge of regulating, establishing, inspecting and controlling the recovery, collection, transport, destruction and emissions of ODS;

(b) The Ministry of Construction (MICON) through its Cement Business Group and the Siguaney Cement plant, will have the responsibility for destruction of ODS recovered in the country;

(c) The Interior Commerce Ministry through the Industrial Equipment and Services Enterprises is in charge of the totality of the process of recovery, collection and transport of the waste ODS to reach the destruction facility.

11. The proposal envisages that funding from the Multilateral Fund will cover the capital costs for the technology required to retrofit the cement kiln with the Japanese technology as an ODS disposal center, and implementation and operation of the pilot project for 4 years. It also foresees certain costs required for transportation of the waste ODS from the collection centres to the central storage facility, and to the final disposal centre, as well as monitoring costs for the project itself. The initial investment of the Multilateral Fund to set up the cement kiln will result in a disposal facility that will be managed by the Cuban government closely linked to the national refrigerator substitution programme.

12. With regard to other funding sources required to maintain the process in future, the pilot project in Cuba will not, at this stage, consider any market-based mechanism outside its own national support for the programme, but will explore other solutions that fit its current situation. The Government of Cuba will continue to finance the operation of the recovery and recycling centres, as well as additional activities under the refrigerator replacement programme which in this instance can be described as the co-financing investment from Cuba to this project.

Monitoring and verification of the destruction

13. The Government of Cuba implemented a detailed and stringent compulsory monitoring and verification plan that is already in place with the recovery and collection process. This is to avoid double counting and error but more particularly to guarantee the traceability and chain of custody of the recovered units, the ODS they contain and their transport towards a storage facility. This system will form the basis of the monitoring system, which will be further reinforced and adapted to follow the ODS all the way from their point of storage to their ultimate destruction, both for destruction using the rotary cement kiln technology, as well as for that using the plasma arc technology.

Cost of the project

14. The total cost of the project has been estimated at US $792,763 plus support costs of US $59,457 UNDP as originally submitted shown in the table below.

Table 1: Cost of the project

Tasks	**Activity**	**# Units**	**US $/Unit**	**Cost**
General				
Local Transportation	Specialized equipment for local transport ODS in Cuba (1000 workshops -> 169 Municipal centers -> 80 R&R Centers -> Central Storage Facilities -> Final Disposal).	2	35,000	70,000
Operating Costs Disposal Centre	Manager (3 years)	As required		Government contribution
	Assistant (3 years)	As required		Government contribution
	Rental of space	As required		Government contribution
	Office Equipment (Including computers for monitoring)			10,000
	Running costs (water, electricity)	As required		Government contribution
	Refrigerant identifiers	4	5,000	20,000
	Recycling unit	1	40,000	40,000
	Cylinders	1,000	80	80,000

	Sub-total			**220,000**
Capital Costs - Cement Kiln Technology				
	Automatic control panel for 2 kilns	1	70,000	70,000
	Equipment, including gauges (high pressure, low pressure), flow valves, regulators, manifolds (high and low pressures), air and oil filters, electronic speed flow transmitter, electronic combustion gas analyzer	1	122,000	122,000
	Electrical components, including cables, switches, tubing, supports, switch boxes, control panel, etc.	1	5,000	5,000
	Hydraulic components, including heating elements, gas cylinders, relief valves, manifolds, gauges, supports, inox steel tubing, electronic weighing scale, portable gas identifier, etc.	1	35,000	35,000
	Labour costs for design and construction of sites	As required		Government Contribution
	Sub-total			**232,000**
Capital Costs - Plasma Arc Technology				
	Plasma Arc ODS destruction machine	1	115,700	115,700
	Maintenance parts for 4 years operation (=4,800 hours)	4	23,500	94,000
	Start up and training (one engineer from Japan)	1	13,400	13,400
	Transformer with stabilizer	1	26,300	26,300
	Protection device for black-outs (UPS battery backup)	1	29,000	29,000
Recovery Machine	Eco-Saver Tetra, 100V-120V with Std Acc	1	3,790	3,790
	Eco-Saver R350 100V-120V with Std Acc	1	8,200	8,200
	Piercing Valve	1	166	166
	Header with valve	1	133	133
	Header without valve	1	74	74
	Sub-total			**290,763**

Assistance and Outreach				
Technical Assistance	Technology Transfer, Training (International Consultant)	1 visit/yr 2 years	30,000	30,000
Outreach and Monitoring	Workshops to share information with other countries in the region and System to control/monitor use and movements of empty/full cylinders, identifiers gas chromatography	2	10,000	20,000
	Sub-total			**50,000**
	Grand-total			**792,763**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

15. The Secretariat provided UNDP with a number of comments and observations on the proposal as reviewed following the criteria set out in decision 58/19.

16. The Secretariat sought clarification from UNDP on the amount of ODS waste that was to be destroyed. While the project indicates that it targets the destruction of 15.1 mt per year, it also mentions that there are 133 mt that have already been collected. UNDP responded by confirming that the project proposal indicates that 60.4 mt of ODS will be destroyed under the 4-year project. It further mentioned that the project will build on previous efforts to create the necessary infrastructure that will allow the country to destroy the remaining, plus future, recovered stocks of ODS waste. The Government of Cuba therefore confirms that 133 mt of ODS will eventually be destroyed. The first four years will be co-financed by the Multilateral Fund and future operations will be borne by the Government of Cuba. UNDP also clarified that, with regard to the HCFC that has been collected, the country indicated that it will re-use this as much as possible and destroy only what is fully contaminated.

17. In reviewing the project preparation request that provided the basis for the submission of this project, the Secretariat noted that the approval of preparation funding was based on the concept that the cement kiln technology will be adapted in the country, and therefore sought justification for the inclusion of the plasma destruction technology. The Secretariat further noted that this process is already being demonstrated in another UNDP project, albeit in another country, and the technology is already commercially available. UNDP indicated the interest of the Cuban Government to look at both options and see how these can be made to work together. However, it acknowledged that the project preparation funding was based on the cement kiln technology and agreed to adjust the proposal to meet the initial expectation of the project.

18. Concerns on the lack of a formal business model that would ensure the sustainability of this project once funding ceases were also expressed by the Secretariat. UNDP clarified that the concept of a business model is slightly different in the Cuban context. The cement factory is one that is owned and run by the government where operational expenses are and will continue to be covered by it. The destruction services will be provided by the Government, therefore it will be its responsibility to cover the cost of running these services and the Government will remunerate the enterprises that are involved in the process. As the country is fully committed to completing not only the energy efficiency part of the project but the destruction of the ODS as well it is hoped that this system, with the assistance of the Multilateral Fund for the capital costs, can be used to demonstrate a full destruction process in other small island developing countries (SIDs) as well perhaps with private investment if seen profitable.

19. In the context of the discussions in the Executive Committee, the Secretariat reminded UNDP about the importance of exploring other sources of funding that may contribute to the sustainability of the project. It mentioned that the document states that market-based mechanisms will not be explored at this time due to the lengthy process that it could take, and requested UNDP to clarify how this fits into its current programmes of looking at alternative sources of funding for carbon credits for which ODS destruction may be eligible for. UNDP clarified that it is currently working actively to identify alternative sources of funding for carbon credits, and this strategy is also being pursued in other ODS waste management demonstration projects. However, in the context of the current proposal for Cuba it is not seen as a viable option in the short run. Cuba is still in the initial phases of exploring the potential of accessing carbon markets. The Government is willing to explore this option further in the future, but does not want to make the project dependent on factors that are completely out of its control. The option that carbon markets could potentially co-finance future operations of the ODS waste management in Cuba will further be explored once the demonstration project has been completed.

20. With regard to the issue of verification of the amounts of ODS to be destroyed, UNDP informed the Secretariat that the cement company will be fully responsible for the destruction of the ODS in the cement kiln. It is proposed that each month the company submits an official report to the Ministry of Science, Technology and Environment and annually to the National Statistics Office. The Center for Environmental Inspection and Control will be responsible for carrying out regular audits to ensure that actual ODS quantities have been disposed of in an environmentally sound manner. The NOU will also conduct periodic inspections at the cement plant destruction facility. The proposed changes in the cement facility will be technically supervised by partners from the Government of Japan, and designed to comply with international destruction standards (99.99 per cent DRE).

21. The Secretariat also queried the length of the project period as submitted, which is four years, and the expectation that this should be completed in one to two years in order for the results to be useful to other countries. UNDP mentioned that the first year would be a period of initial investment and installation and trials can begin only soon after. The continued verification and monitoring of the processes are important in order to maximize the efficiency of the system while minimizing the possibility of damage to the equipment, therefore some time would also be needed to destroy a reasonable quantity of ODS waste. While it would be possible to share initial results after the first two years with other countries in the region, the continued operation of the system is important to make the necessary adjustments and fine-tuning that would help to ensure the long term, cost-effective and risk free operation of the system. This not only applies for the destruction of ODS, but it is equally important for the logistics related to the ODS management (transport, storage, etc.) system in Cuba. However, based on the concerns expressed by the Secretariat, UNDP agreed to adjust the implementation period to three years.

22. The Secretariat and UNDP also discussed the funding requested for the project, and indicated that the costs for the plasma machine cannot be recommended. It also sought clarification for the costs requested for a recovery machine as it assumes that collection is already in place. UNDP clarified that this machine was not something required to recover ODS from obsolete equipment, but rather is required to transfer the ODS between cylinders to facilitate transport. The Secretariat requested UNDP to adjust the costs based on the discussions. This adjustment resulted in a cost of US $11.6/kg of ODS destroyed based on 15.1 mt per year for three years. This cost is within the allowed maximum funding under decision 58/19 of US $13.2/kg as Cuba is a non-low volume consuming (non-LVC) country. The final cost of the project was agreed to be US $525,200 plus support costs. This is summarized in the table below:

Table 2: Agreed costs of the project

Tasks	Activity	# Units	US$/Unit	Cost	Purpose
General					
Local Transportation	Specialized equipment for local transport ODS Waste in Cuba (1000 workshops -> 169 Municipal centers -> 80 R&R Centers -> Central Storage Facilities -> Final Disposal). Including adaptation of vehicles.			70,000	Transport
Operating Costs Disposal Centre	Manager (3 years)	As required		Government contribution	
	Assistant (3 years)	As required		Government contribution	
	Rental of space	As required		Government contribution	
	Office Equipment (Including computers for monitoring)			10,000	Monitoring
	Running costs (water, electricity)	As required		Government contribution	
	Industrial Recovery machines (transfer ODS waste between cylinders), ancillary equipment, associated tools, ODS identifiers, materials, etc.	6	10,000	60,000	Transport & Storage
	Temporary storage cylinders at the 1000 workshops.	1,000	80	80,000	Storage
	Sub-total			**220,000**	
Capital Costs - Cement Kiln Technology					
	Automatic control panel for 2 kilns	1	70,000	70,000	Destruction
	Equipment, including gauges (high pressure, low pressure), flow valves, regulators, manifolds (high and low pressures), air and oil filters, electronic speed flow transmitter, electronic combustion gas analyzer	1	122,000	122,000	Destruction
	Electrical components, including cables, switches, tubing, supports, switch boxes, control panel, etc.	1	5,000	5,000	Destruction
	Hydraulic components, including heating elements, gas cylinders, relief valves, manifolds, gauges, supports, inox steel tubing, electronic weighing scale, portable gas identifier, etc.	1	35,000	35,000	Destruction
	Labour costs for design and construction of sites	As required		Government Contribution	
	10 % contingency		23,200	23,200	

	Sub-total			**255,200**	
Assistance and Outreach					
Technical Assistance	Technology Transfer, Training (International Consultant)			30,000	Destruction
Outreach and Monitoring	Workshops to share information with other countries in the region and System to control/monitor use and movements of empty/full cylinders, identifiers gas chromatography			20,000	Outreach and Monitoring
	Sub-total			**50,000**	
	Grand-Total			**525,200**	

RECOMMENDATION

23. The Executive Committee might wish to consider:

(a) Noting with appreciation the submission of the Government of Cuba of a pilot ODS waste management and disposal project to destroy a total of 45.3 metric tons of ODS waste;

(b) Approving the implementation of a pilot project for ODS waste management and destruction in Cuba at the amount of US $525,200 plus support costs of US $39,390 for UNDP, on the understanding that no further funds will be available for Cuba for any ODS disposal projects in future.

Project Document

Government of Cuba

United Nations Development Programme

Funded by the Multilateral Fund (MLF) for the Implementation of the Montreal Protocol

Pilot Demonstration Project on ODS-Waste Management and Disposal

31 October 2010

COUNTRY:	**Cuba**
IMPLEMENTING AGENCY:	**UNDP**
PROJECT TITLE:	**Pilot Demonstration Project on ODS-Waste Management and Disposal**

PROJECT IN CURRENT BUSINESS PLAN:	**Yes**
SECTOR:	**ODS-Waste**
Sub-Sector:	**Refrigeration Servicing Sector**
PROJECT IMPACT (ODP targeted):	**15.1 Metric Tons/year of CFC-12**
PROJECT DURATION:	**36 months**
PROJECT COSTS:	**US$ 964,590**
LOCAL OWNERSHIP:	**100 %**
EXPORT COMPONENT:	**0 %**
REQUESTED MLF GRANT:	**US$ 525,200**
IMPLEMENTING AGENCY SUPPORT COST:	**US$ 39,390 (7.5 %)**
TOTAL COST OF PROJECT TO MLF:	**US$ 564,590**
COST-EFFECTIVENESS:	**US$ 3.95/kg ODS (metric) based on complete destruction of recovered ODS Waste in Cuba. Not all will be destroyed during the 3 year demonstration project.**
PROJECT MONITORING MILESTONES:	**Included**
NATIONAL COORDINATING AGENCY:	**Technical Ozone Office: Ministry of Science, Technology and the Environment**

Brief Description.

The Technical Ozone Office of the Ministry of Science, technology and the Environment in collaboration with UNDP Cuba has developed an overarching strategy to provide ozone benefits through the Integrated Plan for ODS Reductions for the Refrigeration Sector as shown in Figure 1. This integrated plan brings about the convergence of 3 synergistic interventions: (i) the promotion of energy efficient refrigerators (Cuba), (ii) the project for the recovery and destruction of ODS (Cuba/MLF), and, the chiller replacement project (Cuba/Environment Canada/MLF); The ultimate objective of this plan is to bring economic, social and environmental benefits to the people in Cuba through the scaling up towards energy efficient appliances with low global warming potential (GWP) and zero ozone depleting potential (ODP).

This project seeks to demonstrate the safe and efficient disposal of ODS refrigerants recovered from early retired or end of life (EOL) refrigerators/freezers, air-conditioners and from the servicing sectors using technology developed by Japan for cement kilns and not previously tested in the region. In order to remain within the reasonable budget, the foams recovered from the project will not be considered for destruction under the current project and have been stored for subsequent destruction. The project will continue to destroy ODS Waste once it has been completed.

Although the country is interested in pursuing these options, at present it would in practical terms seem difficult to generate a project for the voluntary market to monetize the ODS destroyed as carbon credit. However, the project will, in keeping an eye to the future, explore this as well as other potential co-financing options.

Lessons learned from this pilot will be shared with other SIDS, as well as Central American countries, and a business model could be developed based on the Cuban experience.

1. INTRODUCTION AND BACKGROUND.

The Government of Cuba is requesting funding for a pilot project to evaluate and demonstrate the safe disposal and destruction of ODS. Cuba has already advanced significantly as regards other aspects included in Decision 58/19, namely recollection, demanufacturing, transport and storage and this final component of management of collected stocks, transport (logistics) and destruction would ensure that the full circle is completed. The project complies with the criteria established by Decision 58/19 including focus on specific aspects not addressed by other pilot projects.

This project will be the first of its kind in the Caribbean region, and it will generate valuable information about possible models to establish a long-term self-sustaining system to collect ODS from the banks and destroy them. Furthermore, this information will also be helpful to other countries interested to undertake similar approaches to manage their ODS banks. As there is no ODS destruction technology or equipment in the neighboring Small Island developing States (SIDS), there is great potential to collect, recover and destroy ODS in banks and in old inventory stocks which further justifies the investment.

The proposal for Cuba contains the following unique and innovative features:

- Out of the 33 ODS Destruction pilots included in the three agencies and Japan business plans, this is the only one addressing all the aspects of a complete ODS waste management system in a SIDS. Although one of the demonstration projects already approved will explore regional and sub-regional transportation of ODS among countries in Asia (possibly including some islands), this is not the case in Cuba where local destruction is considered part of the strategy. As well, none of the demonstration projects approved deal with the logistical characteristics of SIDS.

- If destroying ODS in Cuba is proven to be viable, any lessons learned regarding regional transport could likely be adapted to and used by other islands and Central American countries. The project will generate important lessons regarding economic, environmental, logistical, technical, etc. aspects related to ODS destruction (recollection, transport, storage and final disposal). Similar countries in the Caribbean and CA will be able to learn from this experience and will be able to take informed decisions about their future ODS disposal strategy. It is important to remember that although there are two countries with operational ODS destruction capacity in the region, none of them is at present likely to receive ODS from other countries due to their national waste management policies. For example, Cuba previously explored the possibility of exporting ODS for destruction to other countries however, many barriers (economic, legal, Basel and Rotterdam conventions stipulations, etc.) make it difficult for Cuba to export ODS for destruction. Given the large quantity of ODS that Cuba has already recollected as well as the perspectives for the future collection in light of ongoing efforts, it is considered of the utmost importance to have a national based solution for ODS destruction.

- The demonstration project will build on a remarkable 4 year energy efficiency strategy that is currently in it's last stages, and through which 2.6 million CFC based domestic

refrigerators and air conditioning units have been collected and dismantled, and from which over 48.3 tones of CFC have been collected for destruction. It will in particular help to reinforce the necessary conditions to determine the appropriate logistics for transport, storage and destruction of ODS in Cuba and will explore different options in order to ensure the long-term sustainability of the process.

- With the exception of the destruction technology, and the logistics, storage and transport to ensure the environmentally sound destruction of the collected substances, Cuba has already developed most of the individual components that are needed for a comprehensive ODS destruction system (recollection, transport, storage and destruction). There is a wealth of accumulated data that would take years to collect in a pilot where no previous collection efforts had been undertaken. The challenge and objective of the requested assistance is to set up and fine tune the logistics required to bring all the individual pieces together and make them into a comprehensive and sustainable system coordinated by the central government.

- The purpose of the project is to set up and firmly establish the necessary logistics framework to ensure the effective destruction of ODS (transport, storage, disposal) and demonstrate how it will work in the context of a Small Island Developing State. In particular the project aims to demonstrate the feasibility and respective advantages/disadvantages of destruction technology developed and fine tuned by Japan using rotary cement kilns, which has never previously been tested in the region. The economics and sustainability of ODS destruction in Cuba will be explored in the context of the country's replacement programme, as mentioned above. In 2006 and 2010 a technical delegation from the government of Cuba was invited by the government of Japan to attend demonstrations of the ODS technologies. Subsequent to the demonstrations it was considered that the technologies could perfectly fit the needs of Cuba and countries with comparable characteristics. Given this, Cuba carried out a feasibility study to evaluate a possible site for the cement kiln technology and it was determined that the kiln of the "Fabrica de Siguaney" (Siguaney factory) in the Sancti Spiritus Province of central Cuba was an ideal candidate.

- The country has already invested heavily in this strategy and is willing to continue to support this in the future. With regards to alternative/complementary financial sources to maintain the ODS destruction operations in the future, although the interest exists on the side of Cuba - and even though the Caribbean is underrepresented in the global carbon market - unlike other demonstration projects, the pilot project in Cuba will not consider, at this stage any market based mechanisms. Given in particular Cuba's geopolitical situation it would be difficult to commit to any strategy that will depend on market based mechanisms. The demonstration will focus on alternative solutions to the market based solutions tested in other countries. However it must be pointed out that this is due to the length of the process, and not to a lack of interest. This option would potentially be further explored in the future.

2. OVERARCHING STRATEGY AND PROJECT OBJECTIVES

With the support of the Multilateral Fund (MLF) the implementation of a National Phase-Out Plan is being completed in Cuba through which the CFC phase-out has been fully addressed. In addition, as the phase-out of HCFCs - which have Ozone Depleting Potentials (ODPs) of only 5 to 10% of those of CFCs - is now being supported as well by the MLF, the formulation of an HCFC Phase out Management Plan (HPMP) for Cuba is being pursued.

In this context, and in order to maximize the benefits of a Cuban *National Total Substitution Programme for High-Energy Consuming, ODS Based Refrigerators and Air Conditioners*, the Technical Ozone Office of the Ministry of Science, Technology and the Environment, in collaboration with UNDP Cuba has developed an overarching strategy to provide ozone benefits through an Integrated Plan for ODS Reductions for the Refrigeration Sector as shown in Figure 1.

This integrated plan brings about the convergence of 3 synergistic interventions:

(i) Promotion of energy efficient appliances through substitution (Cuba);
(ii) Project for the recovery and destruction of ODS (Cuba/MLF); and, longer term,
(iii) Chillers replacement project (Cuba/Environment Canada/MLF).

The ultimate objective of this plan is to bring economic, social and environmental benefits to the people in Cuba through technological scaling up towards energy efficient appliances with low global warming potential (GWP) and zero ozone depleting potential (ODP).

Cuba has regulations in place that prohibit the deliberate emission of ODS into the atmosphere (both CFCs and HCFCs) and, as a result, large quantities of ODS have been recollected, amongst others, through the ongoing Substitution Programme for Domestic Refrigeration and Air-conditioning. In addition, ODS from the Chillers replacement programme and the Commercial retrofit programme are also in the process of being recollected.

It is important to note that trained technicians in Cuba are required by law to avoid ODS emissions, to recover ODS from older equipment during maintenance, and to hand over the recuperated refrigerant to the workshops under the supervision of the MINCIN (Interior Commerce Ministry). There is still a large bank of ODS that will benefit from this project, and the government of Cuba is actively promoting their recovery for their eventual destruction.

The ODS waste demonstration project will focus on all aspects described in decision 59/19 (transport, storage and destruction). The project will address ODS waste that has already been recollected and it will also firmly establish a system that will allow Cuba to deal with the destruction of ODS waste to be recollected in the future.

This proposal covers the initial start up costs for the comprehensive ODS Waste Management System in Cuba, and will allow Cuba to destroy the complete current inventory of 133 tons of ODS waste. This would give a CE of approximately 3.95 US$ / kg ODS destroyed.

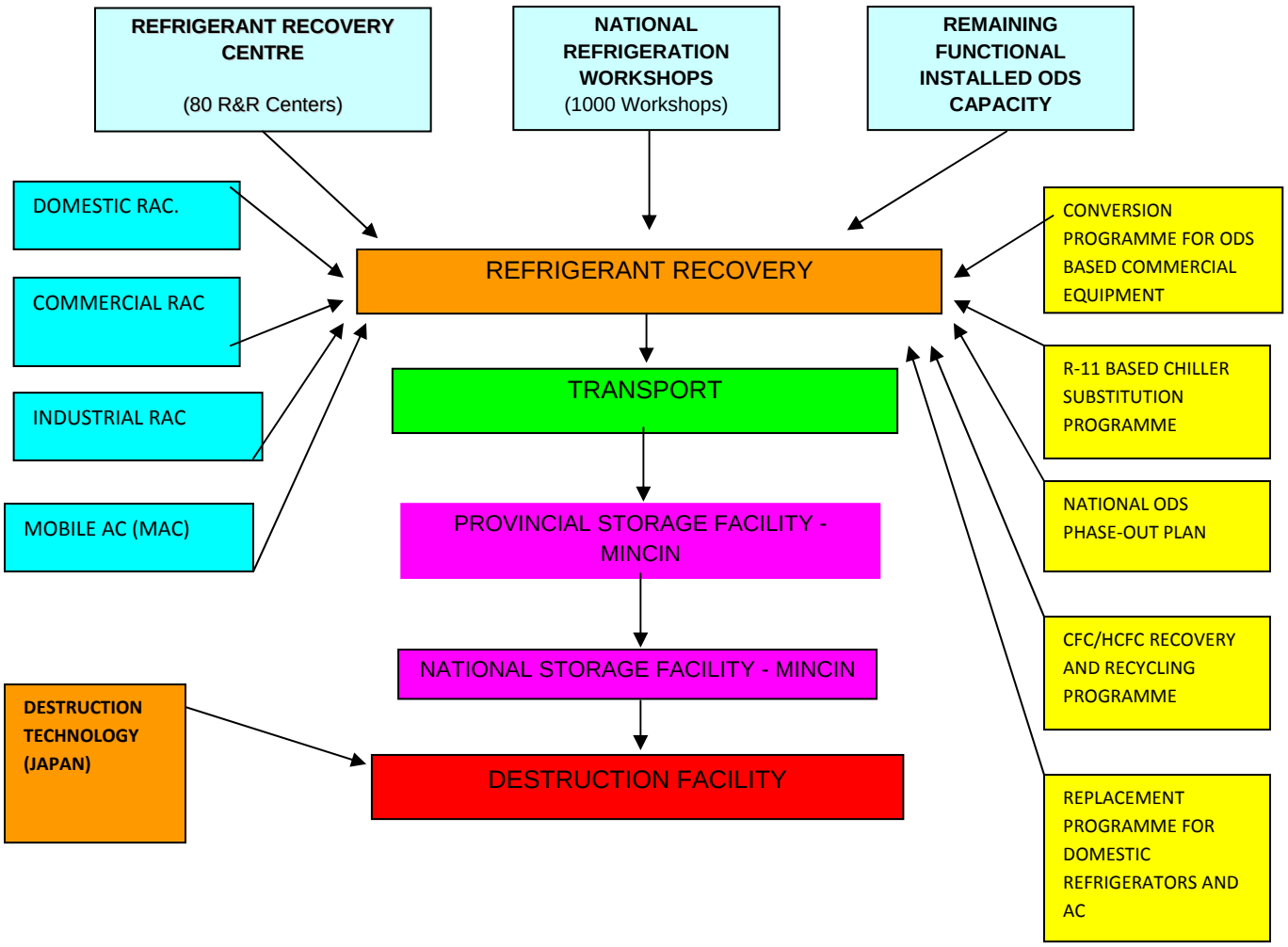


Figure 1 - Integrated Plan for ODS Reductions for the Refrigeration Sector

3. JUSTIFICATION FOR THE ODS-DISPOSAL PILOT PROJECT

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 of the requirements as set out by the above mentioned Decision 58/19:

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

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

In 2006, Cuba introduced the Energy Revolution Year where one important component was to promote the complete substitution of old energy inefficient domestic refrigerators and air-conditioning units. The programme has been actively supported by the National Ozone Unit to ensure that ODS have been properly recovered, following best refrigeration practices. At present, over 2.757 million refrigerators and 276,000 air-conditioning units, on average 20 to 60 years old, have been de-manufactured and replaced with energy efficient units at a cost of over 700 million US dollars to the government of Cuba which has funded the complete recollection, substitution and de-manufacturing programme. The programme aims to ultimately replace the estimated 3 million domestic refrigerators and 300,000 air-conditioning units inventoried in the country.

Under the National CFC Phase Out Plan more than 80 Recovery and Recycling centers have been established and they are playing an invaluable role in the recovery of refrigerants. Although this strategy has born its fruit, the most pressing challenge in Cuba is now related to the setting up of the logistics for a storage, transport and destruction system for the portion of recovered ODS that are so contaminated as to make them unfit for reuse.

The present project will build from the experience gained through the development and implementation of this and previous related programmes and projects to propose a sustainable long term collection, transportation, storage and destruction scheme that could expand to ODS extraction from other kind of banks (i.e. commercial refrigeration and chillers), and eventually HCFC.

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

There are currently no other ongoing chemical disposal programmes in Cuba

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

Cuba has under the National Substitution Programme recovered a total of 133.1 tons of ODS (48.3 tons of CFC and 84.8 tons of HCFC) and in addition, other components under the NPP strongly promote the recovery of ODS in Cuba (additional domestic refrigerators, air-conditioning units, Commercial retrofit programme and Chillers replacement programme). As the recovered ODS comes from more than 3 million pieces of equipment, and as only small quantities have been recovered from each unit, the risk of contamination, mix of different refrigerants, etc. was very high. Although some quantities of HCFCs have been recycled, the large bulk of it, corresponding to quantities mentioned herein are not fit for recycling/reclaim.

The government has indicated its intention to destroy 133 tons of recovered and contaminated ODS, and it expects to recover additional ODS waste in coming years. The first four years of this effort would be co-financed by the MLF.

An initial structure for recovery and recycling is set up in Cuba, and the country expects to build this up to recover additional ODS in the coming years. Although this is offered for information only, a total of up to 299 tons of ODS (including what has already been recovered) could potentially be recovered under the NPP, the Chillers substitution project, and the continuation of the Substitution Programme for Domestic Refrigerators and Air-Conditioning Units.

Description	**Quantity (T)**	**R-12**	**R-11**	**R-22**
National Substitution Programme for Domestic Refrigerators and Air-Conditioning Units	133,1	48,3	-	84,8

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, more than 133 tons of ODS have already been recovered and are currently stored in Cuba, as can be seen from the picture below which was taken in the Central Storage Facility situated in Havana. This shows 1 ton cylinders containing contaminated refrigerant waiting to be processed for destruction.

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.

The substitution of domestic refrigerators and air-conditioning units programme is under full implementation and has been so for several years. As previously pointed out, the Government of Cuba has fully and exclusively funded this and no other donors have been involved in the programme. The Commercial Retrofit programmes under the National Plan, as well as the Chillers replacement projects also actively promote the additional recovery of CFCs.

The replacement programme has benefited the entire population with the replacement of older equipment to new, non-ODS based and energy efficient one. The citizens only pay the real bulk-purchase costs of the units. The transport costs are covered by the government and, multi-year, interest-free payment facilities are provided to the population as an incentive. The refrigerators are picked up at the users domicile, and transported to a specialized center where they are unloaded and where a triage takes place to determine the likely type of refrigerant they contain. The refrigerant is then extracted and stored first in 50 lbs cylinders and then transferred into 1 ton cylinders and great care is taken to avoid accidental releases. The refrigerator carcasses are then transported to a recycling facility where they are dismantled and used as raw material.

The national programme for substitution of domestic refrigerators expects to replace an additional 200,000 domestic refrigerators. The commercial retrofit programme under the NPP is also contributing to recover additional ODS in Cuba. It is important to note that the government of Cuba established all the R&R centers in Cuba and covers the cost of their operation. In complement to what was elaborated above, ODS refrigerants are also recovered and recycled from the over 1,000 workshops disseminated throughout the country servicing companies, ministries, and the different sub-sectors including for example commercial, industrial and MAC.

The activities under the NPP (such as training of technicians, etc.) have been complementary to the programme. 170 Recovery machines were procured under the NPP, and they are currently located in the maintenance workshops in Cuba.

In particular under the Chillers substitution project 9 chillers of between 150 and 250 TR have been replaced with energy efficient and ODS free equipment and this will be extended to an additional 32 chillers in other institutions and areas of the country. The commercial Retrofit programme includes conversion of over 800 equipment units of different sizes and will provide the opportunity to recover more ODS.

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 and HCFCs and no CTC or halon will be involved in this pilot project.

3.2. Detailed information on issues required for project submission

i. Updated information for issues mentioned under project preparation

See above.

ii. Detailed description of the foreseen management and financial set-up.

The recovery, collection and destruction of ODS in Cuba will take place in two main phases and will involve three main partners, in the form of central organizations which will be fully responsible for its implementation.

This will take place with the support of the MLF and the assistance of UNDP.

It is to be noted that, where possible, the HCFC-22 from the commercial and domestic air-conditioners will be recycled for re-use to diminish the needs for ODS-imports.

Overview

Cuba has developed an incredible setup for the recovery and recollection of ODS with more than 1000 workshops of which 169 acts as municipal centers. On top of that, 80 regional Recovery and Recycling Centers were established under the domestic refrigeration substitution programme. The R&R centers were established and equipped and served as centers to demanufacture domestic refrigerators and air con units. This included the recovery of ODS. All workshops are obliged by the government to recover ODS during maintenance operations, and the government of Cuba is considering introducing a system in the future that will further promote/incentivize the recovery of ODS for recycling or destruction.

The operation of the recollection programme in Cuba is fully funded by the government, and most of the recovered ODS Waste comes from the following programmes

- Domestic Refrigerator Substitution Programme (including energy in-efficient Air con units).
- Chillers Replacement Programme
- Commercial Retrofit Programme under the NPP

No funds are being requested for the operation of the recollection scheme in Cuba.

Transport

Transport is a real challenge in Cuba. Transport of ODS waste has so far been done in an ad hoc manner and no structured approach has been taken. A clear limitation in Cuba is the lack of dedicated vehicles for transport of ODS waste, and there is also a lack of cylinders for transport of recovered ODS at the workshop level to municipal centers.

This proposal includes a component that will create a real structure for transport of recovered ODS waste at all levels in Cuba. This includes the procurement of specialized transport units plus the cost of adapting them to transport of ODS between the different actors in Cuba (1000

workshops, 169 municipal centers, 80 R&R centers, regional and central storage facilities, and final disposal at the cement factory. This would include recovery equipment, tools, and materials, ODS identifiers, ancillary equipment, etc. to transfer ODS from smaller to larger cylinders at the transport units.

The government of Cuba would cover the cost of all personnel involved in transport of ODS waste in the country.

Storage

Cuba has regional and central storage facilities that were created under the Domestic Refrigeration substitution programme.

The current system has its limitations and would need some improvements in order to be a fully operational system that would complement the general ODS Waste Management System in Cuba. The government of Cuba is requesting funds to cover the costs of procuring Recovery equipment and associated tools/ODS identifiers/materials/storage cylinders/ancillary equipment that would allow transfer of ODS waste from smaller to larger cylinders as well as temporary storage in the regional and central storage centers. The proposal also includes the procurement of 1000 cylinders that would allow each of the workshops to store temporarily recovered ODS waste until it is transported to the storage centers.

The proposal includes the procurement of 6 powerful recovery machines that can be placed in the specialized transport units (2) and in regional and central storage centers (4). I would be important to note that the recovery machines would need to have a high capacity in order to be able to transfer ODS waste between cylinders of different sizes in Cuba taking into consideration the hot temperatures in the country.

The government of Cuba covers all the operational costs of the facilities.

Final Disposal

The government of Cuba suggested initially pursuing a two-tier strategy with destruction of ODS waste in cement kilns and through the mobile plasma arc technology. Cuba has accepted the recommendation of the MLF Secretariat and will only request funding for the reconversion of the cement kilns at the cement factory.

The government of Cuba would like to request funding to cover the initial start up investment costs to adapt cement kilns to be able to destroy ODS waste. In annex 3 you will find the plans for the cement kiln reconversion and the associated costs have been calculated by the government of Cuba based on the recommendation from the Government of Japan. International experts would be needed to provide technical assistance for technology transfer and training of national experts.

The proposal also include the monitoring of emissions coming from the ODS Waste destruction. This is an important part of a MLF funded project.

The government of Cuba would cover all construction costs (labor) as well as labor costs related to assembling the ODS destruction system at the cement factory. The government of Cuba would cover all operating costs of the system.

10 % contingency has been added to investment costs.

Project Monitoring

A national team of experts will be set up to monitor project implementation and progress. This includes the monitoring of transport, storage and final disposal of ODS in Cuba in order to make the system more effective among all the stakeholders.

The national labor cost of the project-monitoring unit will be covered by the government of Cuba.

Dissemination of results nationally and internationally

Lessons learned will be documented and shared nationally as well as internationally. The project will generate valuable information about how to develop a full system of ODS destruction with a well placed collection, transport, storage and destruction system in place. This would allow other interested countries in setting up a business model that would be based on the Cuban experience.

Responsibilities of participants

- The Ministry of Science Technology and the Environment (Ministerio de Ciencia Tecnología y Medio Ambiente – CITMA, for its acronym in Spanish), through its Technical Ozone Office, is in charge of regulating, establishing, inspecting and controlling the recovery, collection, transport, destruction and emissions of ODS;

- The Ministry of Construction (MICON) through its Cement Business Group and the Siguaney Cement plant, will have the responsibility for destruction of ODS recovered in the country;

- The Interior Commerce Ministry (Ministerio de Comercio Interior - MINCIN for its acronym in Spanish), through the Industrial Equipment and Services Enterprise (Empresa Industrial de Equipos y Servicios - EIESA) is in charge of the totality of the process of recovery, collection and ODS transport until the destruction facilities;

- The MINCIN, through the EIESA is in addition in charge of the destruction of ODS through the Plasma Arc technology in the plant that will be set up in the central "Reforma" warehouses;

- The enterprises and entities that have servicing units (workshops), recovery centres and maintenance brigades as well as banks of equipment have the responsibility to recover and store reusable and/or contaminated refrigerants and to hand them over to MINCIN for final collection and storage;

- The enterprises that possess banks of equipment containing ODS refrigerants have the obligation to avoid their emission and must, at the end of their useful life, use or hire a servicing unit for the recovery and eventual destruction of the refrigerant.

Recovery, collection and transport of ODS

- All refrigeration servicing workshops and maintenance brigades in the country, belonging to any of the organisms (OACE – Organismo de Administracion Central del Estado) are required to avoid the release to the atmosphere of refrigerant from equipment being serviced, repaired, substituted or dismantled and must recover this, store it in equipment loaned to them, and hand it over to the municipal MINCIN workshops, the EIESA or others as previously agreed with the MINCIN. The entities will have recovery and recycling equipment, as well as cylinders to store the ODS to be destroyed.

- The EIESA-MINCIN workshops as well as the municipal MINCIN approved workshops are responsible for adequate handling and storage of ODS received and will deliver in exchange for these a certificate attesting the quantities received. These entities will have recovery and recycling equipment, as well as cylinders to store the ODS to be destroyed.

- The authorized specialized recovery and recycling centers will have the responsibility of avoiding emissions of refrigerant from equipment being serviced or dismantled and must recover this and hand it over to the municipal MINCIN workshops, the EIESA or others as previously agreed with the MINCIN. These entities will have recovery and recycling equipment, as well as cylinders to store the ODS to be destroyed.

- The EIESA of the MINCIN is the enterprise responsible for the recovery, collection and transport of the ODS recovered from the municipal workshops to the central storage facility of the EIESA MINCIN and, from this to the destruction facility. The EIESA will have specialized trucks with recovery and recycling equipment as well as cylinders to store the ODS to be destroyed.

- CITMA-OTOZ will determine the annual national quota for consumption of refrigerant fluids based on the international commitments established under the Montreal Protocol.

- MINCIN is in charge of refrigerant fluids and of the distribution of the quota for Cuba as established by CITMA. MINCIN will establish the basis for their distribution, which will be based on the total recovered amounts by the different stakeholders.

Collection Centers

There are two collection systems working in parallel in Cuba, one for ODS recovered from the refrigerator replacement project, and one covering all other aspects of ODS recovery. The first system is structured around 80 regional collection centers, and the second collection system includes 1000 local level workshops. As there are 169 municipalities, one of the above mentioned 1,000 workshops acts as a municipal level center. The ODS recovered by the 1,000 workshops thus feeds into 169 municipal level workshops. This is complemented by central storage facilities, including the main one in Havana.

Under the refrigerator dismantling project, after stockpiling, the refrigerators are transported to one of the 80 regional dismantling and recovery centres. This decentralized system has the advantage of avoiding the transport of the old refrigerators with dead weight over a long distance to a central area in Havana.

Upon receipt, data for each appliance is recorded, verified and entered into a computer. The ODS from each refrigerator is recovered by the technician using special equipment according to best practices, labeled and stored in cylinders and refrigerators are then dismantled by taking out the compressors and stripping out the door and walls.

The foam insulation is segregated from the metal door and wall. Metal, plastic and wires are sorted and sold to scrap metal dealers. Although the volume of foam that is available in Cuba may make it viable for a vacuum system to be deployed in order to avoid ODS emissions during the dismantling process, this is not contemplated by the country at present. The insulation foam is currently being landfilled for subsequent destruction.

The centers will be managed by trained Managers, supported by technician(s) and assistant(s). The operational costs and salaries will be paid by the Government of Cuba.

The pick up would be scheduled to take place on a regular basis (for example once a month) by means of two specialized truck, each equipped with high volume recovery equipment, identifiers etc and that would in turn deliver this to the destruction facilities. These trucks would also be tasked with maintaining the destruction facilities properly stocked so as to avoid any interruptions in the supply of ODS for destruction.

Equipment needs for the continued recovery, collection and transport of ODS (most of it already provided under NPP).

- Local Workshops

Storage tanks
Recovery equipment
Hoses and connectors

- Municipal Workshops and R&R Centers

Storage tanks
Recovery equipment
Hoses and connectors

- Central Storage facility

Storage tanks
Recovery equipment
Hoses and connectors
Specialized mobile units for recovery including hoses (2)

2 Specialized vehicles are needed to transport the recovered ODS between the different levels (Workshops, Municipal Centers, R&R Centers, Central Storage Facilities, and Final disposal facility).

Equipment needs for destruction of ODS with rotary kiln technology

Rotary cement kilns provide an excellent technical option for the destruction of ODS given specific characteristics such as:

- High flame temperatures which can reach 1800-2000 Cº and 1400-1500 Cº in the substances, virtually guaranteeing destruction of all organic matter;
- Long residence times, as a consequence of large oven size and volumes, which can reach 6 seconds in the oven per-se, and not considering the residence time in the thermal interchange towers. This allows for the oxidation of all gas–phase organic compounds;
- Highly alkaline environment within the clinker kiln, which guarantees that all acidic components such as hydrochloric and hydrofluoric acids and other sulfur compounds (SO2 and SO3) will be neutralized;
- No residues are generated in the form of either ashes or scoria. In small quantities, heavy metals are incorporated, in a stable form, into the structure of the clinker and do not affect its properties or final quality.

Given the high temperatures and long residence times, these kilns are ideal vehicles to destroy organic compounds of a high chemical stability such as CFCs and HCFCs. The destruction of Freon gases in rotary cement kilns solves one of the main problems associated with the destruction of these kinds of substances, namely the emission of acidic gases (HCL & HF) given that these react with the calcium salts present in the primary feedstock, and combine to form CaCl2 and CaF2, these are not emitted as gases, but rather come to form a part of the clinker while not affecting its intrinsic properties or quality.

On the other hand, chlorine contained in these gases constitutes the main problem given that it can, not only affect the quality of the cement, but also the kiln itself. An excess of this gas in the hot gas flux of the kiln will contribute to the unlimited thickening of the crust that adheres to the refractory coating and that can reduce significantly the interior of the kiln, affecting its productivity and as a result the whole country, in particular as regards white cement as there is

only one such facility in the country. This effect is significantly more marked in dry process kilns.

For the above-mentioned reasons the precise and continuous control of the dosage of CFCs and HCFCs being injected into the kiln is the single most important requirement in the destruction process of these gases.

Consultation with local experts has indicated that there are at least one cement plant in Cuba that can be set up as an ODS-Disposal Centre and used for the destruction of ODS waste. This facility, known as the Siguaney Cement Plant of the Grupo Empresarial del Cemento (Cement Business Group) is located in the town of Siguaney located in the province of Sancti Spiritus, approximately 300km to the South-East of Havana. This facility includes 4 rotary kilns (3 for grey process, one for white, each capable of producing 22 tons per hour) that are slated to produce for 2011 a total of 141,000 tons of grey cement and 56,000 tons of white cement under the humid type process.

It is proposed under this project to adapt 2 of the 4 kilns for destruction (one producing grey and one producing white cement). The combined clinker production capacity for 2011 of these two kilns is planned at 103,000 tons, which, considering a destruction potential of 0.1kg of CFC/ton of clinker represents a destruction capacity slightly under 10.3 tons of CFC per year (or a higher quantity of other types of ODS waste).

The required set up for the injection of ODS into the kilns includes:

Area for reception and storage of cylinders – requires the construction of a closed facility to store cylinders at ambient temperature and includes a scale for weighing as well as a system to transport them.

Dosage area – requires the construction of a closed facility where the conditions for the positioning of the cylinders from which the gas will be injected into the kiln will be created. This includes:

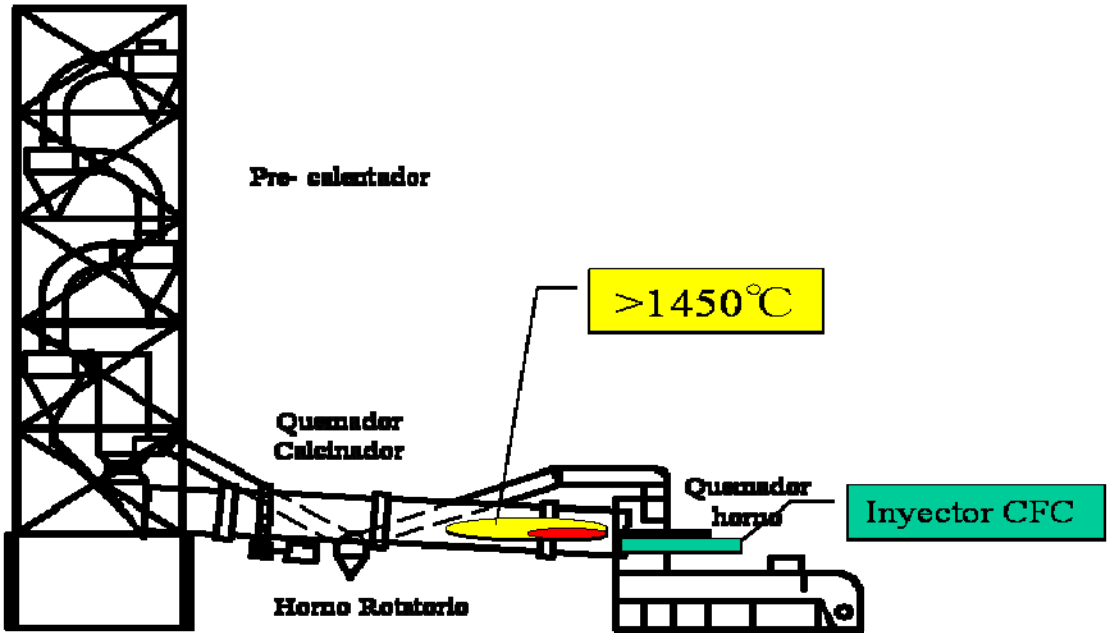
- Tanks to place the cylinders in a 30^0 C bath to facilitate the extraction of the gas. For 100 kg cylinders a system of irrigating collars to increase the height of the bath will be required;
- System of manifolds and gauges allowing for the simultaneous connection of the cylinders to the main circuit connecting to the kiln, via a pressure regulator and an automatic control panel;
- Vacuum pump to fully recover the gas from the cylinders;
- Filter system to recover and separate oil containing gas mixtures, to avoid clogging of the system;
- Insulating material to cover piping and ensure temperature control;
- Hoist system for cylinders.

0.5” piping will be used to inject ODS into the primary air fan of the kiln burner. It is important to note that the injection of these gases should only take place once the kiln has reached a stable

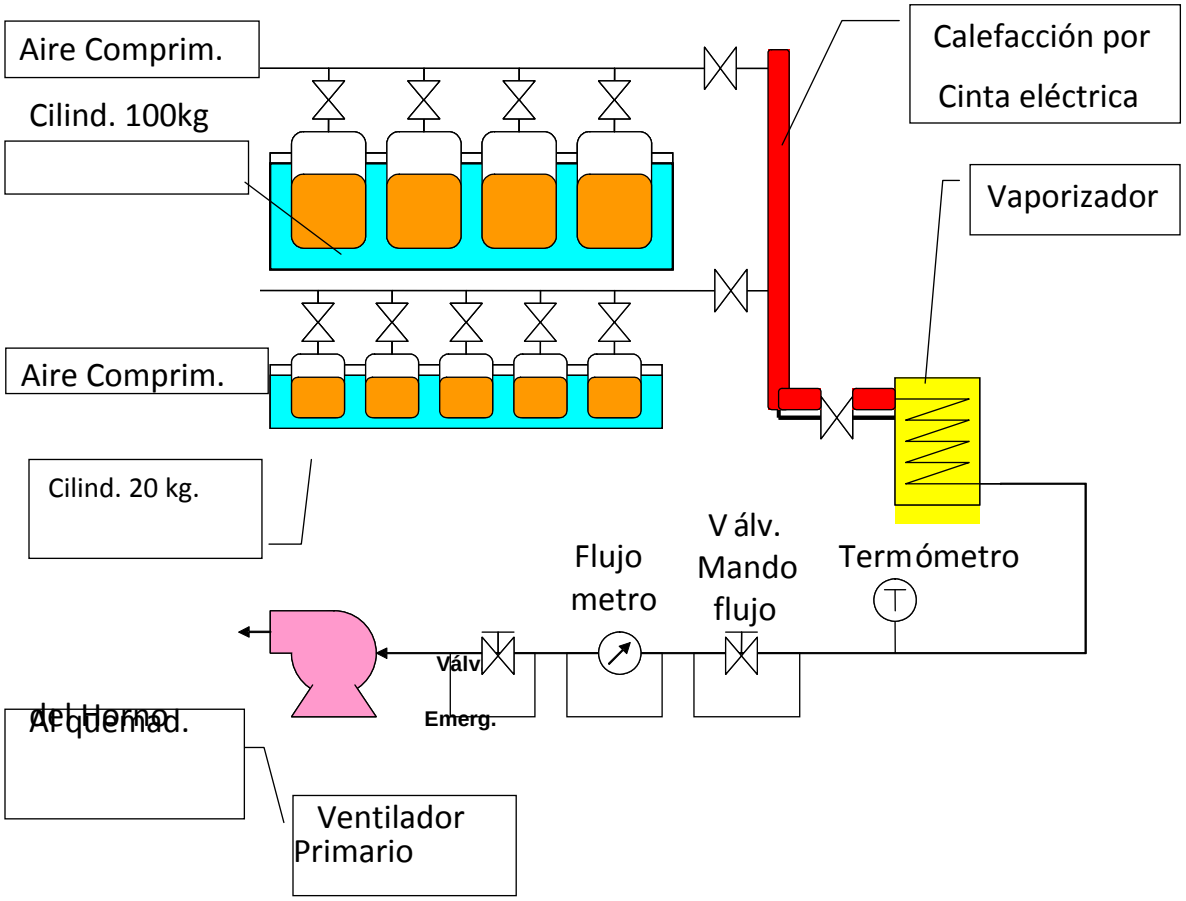
operating condition and an emergency valve will be placed close to the entry point for automatic cut-off, should there be any unexpected interruptions in the operation of the kiln.

The dosage of gases injected into the kiln will take place according to the concentration of CFC present in the feedstock flux, in such a way that the stable operation and quality of the clinker will not be affected.

The following diagrams illustrate the intended set-up of the system, as well as the parts required and were developed based on information and recommendations provided by Japan.



Feedstock system



	Components	**Quantity**
1	Emergency shut off valve	2
2	Flow control valves	2
3	Flux meter	2
4	Air filters	2
5	Two stage vacuum pump	1
6	Hot water pump	1
7	Temperature regulating valves for the warm water baths	3
8	Automatic electric switching valves (line changes)	7
9	Ball valves (cylinder connectors)	60

10	Hoses (cylindre connectors)	30
11	Rail for transport of cylinders	1
12	Ball valves for refrigerant, degassing and vapour	9
13	Valves for general maintenance	13
14	Control valve for entry point into feedstock line	1
15	Valves for entry point into circulation line	2
16	Ball valve for entry point into vaporizing chamber	1

Total cost of the disposal activity including costs not covered by the Multilateral Fund and, the sources of funding for covering these costs

The total collection, transport, dismantling, recovery and the destruction cost of CFC-12 and HCFC-22 using the cement kiln technology have been estimated in this document to be of approximately US$400,000 for the government of Cuba and of US$525,200 for the MLF plus 39,390 US$ in support cost, bringing the grand total to US$964,590. These indicative data will be verified at project implementation.

Project sustainability of the underlying business model

The MLF funding will cover the costs of implementation and operation of the pilot project for 4 years. With the expected destruction of an estimated 15.1 tons per year, this project could potentially destroy the currently stored ODS in around 8 years.

The concept of a business model is slightly different in the Cuban context as the Cement factory is a company that is owned and run by the government of Cuba and, operational expenses at the cement factory are covered by the government of Cuba (now and in the future). The costs of the services are assumed by the government of Cuba as a part of its commitment to the environment.

It is the Government of Cuba's responsibility to cover to cost of running the services and it will pay to the government enterprises that are involved in this scheme. In other words, a business model exists but the characteristics are different from what is seen in many other countries.

iii. Other sources of funding.

As mentioned throughout this document, the Government of Cuba has to date invested over 700 million US dollars to collect, manage and store the ODS intended for destruction and intends to continue supporting the recovery, collection and transport activities, as well as to continue providing support through technical expertise, storage facilities, staff (including engineers,

managers, technicians, assistants, etc.), training facilities, assembly/construction, equipment, monitoring etc. as might be required by the project.

The government of Cuba will continue to finance the operation of 80 R&R centers, as well as additional activities under the refrigerator replacement programme, (to name a few) which as described in this document, represent a huge co-financing investment from Cuba in this project

In addition, there are already around 1,000 workshops integrated into this activity, representing an estimated 5,000 technicians, 80 R&R Centers and Central Storage Facilities, and the cost of operation are financed by the country. In addition, there is currently in place a fully computerized database that is centrally controlled by EIESA. This requires equipment, IT expertise and follow up, and the database is updated regularly to take into account all of the changes and movements relative to the collection, transport and storage of ODS.

Although this investment cost is to be verified during project implementation, an initial estimate is that an amount representing no less than US$ 400,000 will be required and provided by Cuba, to ensure provision of the above-mentioned services. This is a very low estimate provided by the government of Cuba, and the real cost is much higher.

Although as also mentioned previously Cuba would be interested in exploring this approach in the future, at present in practical terms there are no voluntary market options for Cuba. However it is important to note that the energy savings achieved from the decommissioning of energy-inefficient units has allowed for large reductions in consumption of fossil fuels on an annual basis, and has in addition liberated thermoelectric generation capacity which is vital for the development of the country.

UNDP is actively working on looking for alternative sources of funding for carbon credits, and this strategy is actively being pursued in other ODS Waste Management Demonstration projects. However, in the context of the current proposal for Cuba this is currently not seen as a viable option in the short run. Cuba is still in the initial phases of exploring the potential of accessing Carbon Markets and is willing to further explore this option in the future, however the country does not want to make project success dependant on factors that are completely out of its control. Exploring the option that carbon markets could potentially co-finance future operations of the ODS waste management in Cuba, once the demonstration project has been completed, will however be pursued.

iv. Concept for monitoring the origin of recovered ODS

In order to guarantee the accurate and almost “real-time” monitoring of the Cuban implemented *National Total Substitution Programme for High-Energy Consuming, ODS Based Refrigerators and Air Conditioners*, the government implemented a detailed and stringent compulsory monitoring and verification plan. This not only to avoid double counting and error but more particularly to guarantee the traceability and chain of custody of the recovered units, the ODS they contained and their transport towards a storage facility.

This system will form the basis of the monitoring system which will be further reinforced and adapted to follow the ODS all the way from their current point of storage to their ultimate destruction, both for destruction using the rotary cement kiln technology, as well as for that using the plasma arc technology.

v Assurances that the amount of ODS mentioned will actually be destroyed.

These assurances will be provided and backed up by the registry held in the destruction facilities which will have to match that of the central storage facilities and which will, in addition, be backed up by the certificates provided to the enterprises from which ODS have been picked up.

The Cement Company is responsible for the destruction of the ODS in the cement kiln. Each month it must submit an official report to the CITMA (Ministry of Science, Technology and Environment) and annually to the National Statistics Office. The Center for Environmental Inspection and Control is the unit that will carry-out frequent audits to assure that actual ODS quantities have been disposed of in an environmentally sound manner. The national ozone unit will also conduct periodic inspections at the cement plant destruction facility.

The proposed activities at the cement facility have been elaborated by officials from the government of Japan and would allow Cuba to comply with international standards

An additional source of information will be the registry from the automatic injection facility to be set up at the kiln, as well as the registry of use from the plasma arc machine, which can also be correlated with actual produced quantities of cement.

vi Exploration of other disposal options for the used ODS.

Although other options were studied, including transporting these ODS for destruction abroad (for which initial estimates prepared by Cuba showed that price to destroy over 260 tons ranged in the 2.5 to 3 million dollars), as well as burning these in the flaring towers (not allowed for under the UNFCCC), the only viable alternatives for the country were the ones detailed throughout the document.

More importantly, the costs of destruction of the current stock should not be compared with the cost of the start up activities in Cuba for the simple reason that the two things aim at doing different things. Exporting all ODS waste would eliminate Cuba's current problem with ODS waste but there would be no installed capacity at the local level to deal with future stocks of recovered ODS waste. On the contrary, the suggested project would install national capacity that would allow Cuba to deal with ODS waste not only now, but also in the future.

4. PROJECT COSTS

Table-4: Project Budget – cost estimation

Tasks	Activity	# Units	US$/Unit	Cost	Purpose
General					
Local Transportation	Specialized equipment for local transport ODS Waste in Cuba (1000 workshops -> 169 Municipal centers -> 80 R&R Centers -> Central Storage Facilities -> Final Disposal). Including adaptation of vehicles.			70,000	Transport
Operating Costs Disposal Centre	Manager (3 years)	As required		Government contribution	
	Assistant (3 years)	As required		Government contribution	
	Rental of space	As required		Government contribution	
	Office Equipment (Including computers for monitoring)			10,000	Monitoring
	Running costs (water, electricity)	As required		Government contribution	
	Industrial Recovery machines (transfer ODS waste between cylinders), ancillary equipment, associated tools, ODS identifiers, materials, etc.	6		60,000	Transport & Storage
	Temporary storage cylinders at the 1000 workshops.	1000	80	80,000	Storage
Capital Costs - Cement Kiln Technology					
	Automatic control panel for 2 kilns	1	70,000	70,000	Destruction
	Equipment, including gauges (high pressure, low pressure), flow valves, regulators, manifolds (high and low pressures), air and oil filters, electronic speed flow transmitter, electronic combustion gas analyzer	1	122,000	122,000	Destruction
	Electrical components, including cables, switches, tubing, supports, switch boxes, control panel, etc.	1	5,000	5,000	Destruction
	Hydraulic components, including heating elements, gas cylinders, relief valves, manifolds, gauges, supports, inox steel tubing, electronic weighing scale, portable gas identifier, etc.	1	35,000	35,000	Destruction

	Labour costs for design and construction of sites	As required		Government Contribution	
	10 % contingency		23,200	23,200	
Assistance and Outreach					
Technical Assistance	Technology Transfer, Training (International Consultant)		30,000	30,000	Destruction
Outreach and Monitoring	Workshops to share information with other countries in the region and System to control/monitor use and movements of empty/full cylinders, identifiers gas chromatography			20,000	Outreach and Monitoring
	Total			**525,200**	

On behalf of the Government of Cuba, UNDP requests a grant for the first phase of this project amounting to

Project Cost - US$ 525,200

Support Cost (7,5 %) - US$ 39,390

Total Cost - US$ 564,590

IMPLEMENTATION/MONITORING

Table-5: Implementation Schedule

TASKS	2011				2012							
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q
MF Project Approval (end 2010)												
Receipt of Funds	X											
Grant Signature		X										
Project Start-up		X										
Procurement arrangements		X										
Arrival of equipment			X	X								
Phase I – Training and trials												
Arrival of parts and set up of kiln facility			X									
Arrival of Plasma machine and chemicals				X								
- Training by supplier				X								
- Trial and Testing					X							
Analysis/Reporting/ preparation phase II						X						
Phase II - Operation												
Operation						X	X	X	X	X	X	X
Mid term and final Analysis/Reporting								X			X	
Final report												X

Table-6: MILESTONES FOR PROJECT MONITORING

TASK	MONTH*
Project document submitted to beneficiaries	2
Project document signatures	4
Procurement of technologies	6
Phase I – Modifications to cement kiln and testing	7
Testing/analysis/reporting	7
Phase II – start of full scale operations	7
Phase 1 – Training and trial runs Plasma machine and chemicals delivered	8
Training and Trial Runs	9
Testing/analysis/reporting	10
Phase II – start of full scale operations	12
Mid-term review – analysis/reporting	24
Phase II project closure – final reporting	48

* From project approval

From experience, demonstration projects normally take more time than what was initially foreseen. One good example is the successful Chillers demonstration project.

In the beginning there will be a period of initial investment and installation. Then trials and start up will follow. The continued verification and monitoring of the processes are important in order to maximize the efficiency of the system while minimizing the possibility of damage to the equipment. Some time would also be needed to destroy a reasonable quantity of ODS waste. It should be possible to share initial results after 1-2 year with other countries in the region but the continued operation of the system is important to make the necessary adjustments and fine-tuning that would help to ensure the long term, cost-effective and risk free operation of the system.

This not only applies for the destruction of ODS, but it is equally important for the logistics related to the ODS management (transport, storage, etc.) system in Cuba.

6. Appendixes

Appendix 1: Transmittal Letter

Appendix 2: Quotation from ASADA Corporation

Appendix 1: Transmittal Letter

Appendix 2: Quotation from ASADA Corporation

Asada
ASADA CORPORATION

3-60 KAMIIDA NISHI-MACHI, KITA-KU,
NAGOYA, 462-8551 JAPAN
TEL: (81)52-914-1206, FAX: (81)52-914-2011

Dear DR. NELSON ESPINOSA
DIRECTOR, OFICINA DE OZONO DE CUBA

Date; August 6, 2010
Ref.

QUOTATION #2

		Unit Price
1) Recovery Machine		
Model Eco Saver Tetra, 100V-120V with Std Acc	C&F Havana with Plasma 〉	$3,790.00
Model ECO Saver R350 100V-120V with Std Acc	C&F Havana with Plasma 〉	$8,200.00
2)Piercing Valve(#TF014)	C&F Havana with Plasma 〉	$166.00
3)Header		
With Valve (#TF039)	C&F Havana with Plasma 〉	$133.00
Without Valve(#TF01:	C&F Havana with Plasma 〉	$74.00

Bankers: MIZUHO BANK, LTD. NAGOYA-CHUO BRANCH
3-4-5 SAKAE NAKA-KU, NAGOYA, JAPAN
THE BANK OF TOKYO-MITSUBISHI UFJ, LTD. HIGASHI BRANCH
1-15-30 TOKUGAWA, HIGASHI-KU, NAGOYA, JAPAN