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COMITÉ EJECUTIVO DEL FONDO MULTILATERAL
PARA LA APLICACIÓN DEL
PROTOCOLO DE MONTREAL
Sexagésima sexta Reunión
Montreal, 16 – 20 de abril de 2012

PROPUESTAS DE PROYECTO: COLOMBIA

El presente documento consta de las observaciones y recomendaciones de la Secretaría del Fondo sobre las siguientes propuestas de proyecto:

Destrucción

- Proyecto experimental de demostración sobre gestión y eliminación de desechos de SAO — PNUD

Eliminación

- Plan de gestión de eliminación de HCFC (etapa I, segundo tramo) — PNUD/PNUMA

HOJA DE EVALUACIÓN DE PROYECTO – PROYECTO NO PLURIANUAL

COLOMBIA

TÍTULO DEL PROYECTO	**ORGANISMO DE EJECUCIÓN**
Proyecto experimental de demostración sobre gestión y eliminación de desechos de SAO	PNUD

ORGANISMO NACIONAL DE COORDINACIÓN: Unidad Técnica Ozono (UTO)

ÚLTIMOS DATOS NOTIFICADOS SOBRE CONSUMO DE SAO QUE SE ABORDAN EN EL PROYECTO

A: DATOS SOLICITADOS EN EL ARTÍCULO 7 (TONELADAS PAO en 2010)

Anexo I, CFC	0		

B: DATOS SECTORIALES DEL PROGRAMA DE PAÍS (TONELADAS PAO, 2010)

SAO	**Subsector/cantidad**	**Subsector/cantidad**	**Totales**
CFC			0

PLAN ADMINISTRATIVO DEL AÑO EN CURSO: Financiación total 1 209 375 $EUA Eliminación total 75 toneladas PAO

TÍTULO DEL PROYECTO

USO DE SAO EN EMPRESAS		n/a
SAO QUE SE ELIMINARÁN		n/a
SAO QUE SE INCORPORARÁN		n/a
PROYECTO EN EL PLAN ADMINISTRATIVO ACTUAL		Sí
SECTOR		Desechos de SAO
SUB-SECTOR		Sector de servicio y mantenimiento de refrigeración
IMPACTO DEL PROYECTO		114 toneladas métricas de CFC-12
DURACIÓN DEL PROYECTO		36 meses
PROPIEDAD LOCAL		100%
COMPONENTE DE EXPORTACIÓN		%
SUMA SOLICITADA AL FONDO	$ EUA	1 195 000
GASTOS DE APOYO AL ORGANISMO DE EJECUCIÓN (7,5%)	$ EUA	89 625
COSTO TOTAL DEL PROYECTO PARA EL FONDO MULTILATERAL	$ EUA	1 284 625
EFICACIA EN FUNCIÓN DE LOS COSTOS	$ EUA/kg	10,48 SAO(métricas)
HITOS EN LA SUPERVISIÓN DEL PROYECTO		Incluidos

RECOMENDACIÓN DE LA SECRETARÍA:	Sometido a consideración particular

DESCRIPCIÓN DEL PROYECTO

Introducción

1. En nombre del Gobierno de Colombia, el PNUD ha presentado a la 66ª reunión una propuesta de proyecto experimental de demostración sobre gestión y eliminación de desechos de sustancias que agotan la capa de ozono (SAO) por un valor de 1 195 000 $ EUA en la forma originalmente presentada. Este proyecto se presenta en consonancia con la decisión 58/19 y atenderá a la destrucción de 114 toneladas métricas (tm) de desechos de SAO en el país.

2. En su 57ª reunión, el Comité Ejecutivo proporcionó fondos al PNUD para preparar un proyecto experimental de demostración sobre SAO para Colombia. En esa reunión, se adoptó la decisión de examinar los proyectos experimentales de eliminación de SAO que respondieran a la decisión XX/7 de la Vigésima Reunión de las Partes en la que se declaraba que los proyectos experimentales podían abarcar el acopio, transporte, almacenamiento y destrucción de las SAO, concentrándose en las reservas ensambladas con alto potencial de calentamiento mundial neto, y en una muestra representativa de países del Artículo 5 regionalmente diversos. Las Partes también hicieron hincapié en que los proyectos de demostración de eliminación de SAO deberían ser viables y deberían incluir métodos para procurar la cofinanciación. Colombia fue uno de los países seleccionados en base a estos criterios.

Antecedentes

3. En la 58ª reunión del Comité Ejecutivo se debatió acerca de criterios y directrices para la selección de proyectos de eliminación de SAO, lo que condujo a la decisión 58/19. Con esta decisión se estableció la base para el examen y aprobación de los proyectos de demostración de eliminación de SAO. La Secretaría realizó un examen de esta propuesta sobre la base de los principios establecidos al respecto en la decisión. La Secretaría también aplicó lo indicado en el inciso a) ii) de la decisión en el que se especificaba que no habrá financiación disponible para el acopio de desechos de SAO en el proyecto experimental. La definición para el acopio de SAO se incluía en un anexo al informe de la 58ª reunión denominado “Definiciones de actividades incluidas en las directrices provisionales para la financiación de proyectos de demostración para la destrucción de las SAO”. El proyecto experimental para Colombia abarcará las SAO ya acopiadas así como cantidades adicionales por acopiar en virtud de una política nacional de próxima aplicación para equipos eléctricos y electrónicos de desecho que entraría en vigor para 2013.

4. El proyecto experimental de demostración procura demostrar un enfoque sostenible de la gestión de desechos de SAO a partir de su acopio hasta su destrucción mediante el fortalecimiento de las capacidades de destrucción de las instalaciones nacionales de Colombia integrándolas en iniciativas más amplias relativas a desechos peligrosos, equipos eléctricos y electrónicos de desecho y eficiencia energética en el país. El cronograma del proyecto también brinda una oportunidad de obtener sinergia con un proyecto de Instalación Global para el Medio Ambiente que procura lograr la eliminación de existencias de desechos de bifenilos policlorinados, que se ejecutaría paralelamente y bajo una supervisión institucional común. Estas actividades se complementarían con proyectos existentes actualmente, en particular el plan de gestión de eliminación de HCFC y sus actividades relativas a las operaciones de recuperación para el servicio y mantenimiento del equipo de refrigeración existente, que también generará volúmenes de desechos de SAO que no pueden volver a utilizarse. Como Anexo I al presente documento se presenta una propuesta detallada del proyecto.

Descripción del proyecto

5. El proyecto experimental atenderá inicialmente a la eliminación de 114 toneladas de desechos de SAO para su destrucción. También establecerá medidas para apoyar la sostenibilidad del proyecto teniendo en cuenta los desechos de SAO disponibles que serán acopiados a través del sólido sector

nacional de servicio y mantenimiento de equipos de refrigeración operado por una red de técnicos bien equipados y compañías del sector privado con equipos de recuperación de refrigerantes distribuidos a centros de reciclaje y regeneración en todo el país. Esta red de acopio contará con el apoyo de tres iniciativas de políticas conexas y coordinadas que se están implantando y resultarán en la generación de considerables volúmenes de SAO en fin de su vida útil cuya destrucción es necesaria.

6. La primera iniciativa abarca el uso racional y eficiente de la energía y de fuentes de energía no convencionales, que comprenden un elemento de sustitución de refrigeradores de uso doméstico por modelos más eficientes desde el punto de vista energético. Este programa también funciona dentro del marco de un proyecto financiado por la Instalación Global para el Medio Ambiente que abarca la eficiencia energética de edificios, incluyendo la consideración de los sistemas de aire acondicionado. El segundo programa involucra la elaboración de estrategias a largo plazo con una política ambiental más amplia sobre gestión de desechos peligrosos, uno de cuyos objetivos incluye la ejecución de un plan de acción correspondiente al Convenio de Estocolmo y la eliminación de SAO en el marco del Protocolo de Montreal. Esta iniciativa ha dado como resultado el desarrollo de modernas instalaciones de incineración con hornos giratorios de alta temperatura en los dos últimos años, proporcionando una opción para la destrucción de SAO, sujeta a que las instalaciones satisfagan las normas internacionales sobre destrucción. El tercer programa de política es el relativo a los equipos eléctricos y electrónicos de desecho, un programa cada vez más amplio sobre recolección de desechos de equipos eléctricos y electrónicos, una de cuyas componentes trata específicamente el retiro temprano de equipo más antiguo de refrigeración y aire acondicionado doméstico y comercial que utiliza CFC-11 y CFC-12. Esto será financiado en parte por un mecanismo de responsabilidad extendida del productor que abarca la sustitución subsidiada de refrigeradores de uso doméstico por equipo de alta eficiencia que no utiliza SAO, que abarcará los costos relacionados con la recolección, tratamiento y gestión ambientalmente eficiente de los desechos del equipo descartado, incluyendo la destrucción de refrigerantes y espumas.

7. Estas tres políticas han resultado en la adopción de un objetivo nacional de sustituir 2,6 millones de refrigeradores domésticos basados en CFC en un período de diez años a partir de 2013. El objetivo de este proyecto experimental será los desechos de SAO acopiados de 300 000 refrigeradores que han de procesarse durante un período inicial de dos años (2013-2015) y que producirían 114 toneladas de CFC-11 y CFC-12 para su destrucción.

8. El enfoque general adoptado para destruir los desechos de SAO en Colombia será mediante destrucción en el país, utilizando la capacidad nacional de gestión de desechos peligrosos e industriales existente en el país. Por consiguiente, el objetivo del proyecto experimental será demostrar la forma en que un país en desarrollo puede desarrollar capacidad nacional para gestionar SAO en fin de vida útil para una aplicación más amplia mediante certificación de las capacidades de tres instalaciones nacionales de incineración con hornos giratorios (TECNIAMSA SA Barranquilla, TECNIAMSA SA, Bogotá y PROSARC, SA, Mosquera) para la destrucción de CFC-12, CFC-11 en fin de vida útil y espuma de poliuretano con CFC-11 a fin de satisfacer las normas internacionales, y mediante la realización de quemados completos de ensayo de no menos de 5 toneladas de cada una de estas corrientes de desechos en por lo menos una instalación. Dos de estas instalaciones se modificarán mediante la adición de un puerto de inyección para el CFC-12, mientras que la otra se ocuparía de la destrucción de espuma recogida de refrigeradores. Se aplicará un protocolo de vigilancia que abarque las condiciones de funcionamiento (es decir temperaturas de la cámara de combustión, tiempos de residencia estimados, temperaturas de la chimenea), el menú normalizado de emisiones reglamentadas incluyendo dibenzo-p-dioxina policlorinada y dibenzofurano policlorinado así como datos de balance de masas que abarcan todos los trayectos de liberación residual (sólidos, líquidos y gaseosos), así como el análisis de contaminantes clave (incluyendo el dibenzofurano policlorinado en residuos de lavado en forma de cenizas sólidas en el fondo) y cualquier corriente residual líquida. La intención es determinar tanto la eficiencia de destrucción y eliminación como la eficiencia de destrucción.

9. Se prevé que la ejecución del proyecto de demostración de destrucción de SAO insuma tres años.

Estimación de las SAO por destruir

10. Como se indicó anteriormente, el volumen de SAO que ha de manejar el proyecto experimental será de 114 toneladas. De estas, 11 toneladas ya se han acopiado y almacenado en cilindros para CFC-12 y en espuma recogida en bolsas que contiene CFC-11. Estas cantidades están listas para su destrucción. Los volúmenes de desechos de SAO que se estiman para la duración de tres años del proyecto comprenderán cantidades procedentes de un sistema nacional de recolección existente. En la Tabla 1 se muestran las cantidades estimadas:

Tabla 1: Cantidades estimadas de desechos de SAO que se utilizarán en el proyecto

Origen y cantidades		2012			2013				2014				2015	
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
CFC-11	*Total **8 120 kg***													
En recuperación, recuperadas y almacenadas	4 120 kg	—												
Por recuperar para 2012	900 kg	—	—	—										
Por recuperar para 2013	3 100 kg	—	—	—	—	—	—							
CFC-12	*Total **5 674kg***													
Recuperadas y almacenadas	5 674 kg	—												
Otros	***1 249 kg***													
HCFC, mezclas de HF	919 kg	—												
CTC	330 kg	—												
CFC del programa de responsabilidad ampliada de productores	***99 000 kg***													
CFC-11 en espuma de embalado	65 000 kg		—	—	—	—	—	—	—	—	—	—	—	
CFC-12	34 000 kg		—	—	—	—	—	—	—	—	—	—	—	
TOTAL	**114 043 kg**													

Gestión financiera del proyecto

11. En la propuesta se preveía que la financiación del Fondo Multilateral cubriría los costos necesarios para ensayar las instalaciones de incineración seleccionadas, y elevar su funcionamiento para satisfacer las normas internacionales que permitan destruir en los tres próximos años los volúmenes de SAO indicados anteriormente. También se preveía que una vez completado el proyecto experimental, el funcionamiento futuro de estas instalaciones quedará abarcado enteramente por el programa de responsabilidad extendida del productor/equipos eléctricos y electrónicos de desecho, donde otros materiales recogidos de equipos viejos generarán suficientes ingresos que permitirán financiar la destrucción sostenida de futuros desechos de SAO. El actual número objetivo de refrigeradores en fin de vida útil que han de abarcarse después de terminado el proyecto experimental será de más de 2 millones de unidades, previéndose que produzcan unas 700-800 toneladas de desechos de SAO, según un cálculo conservador.

Selección de tecnología/enfoque de destrucción

12. Las diversas opciones estratégicas y tecnológicas para destruir SAO en fin de vida útil, incluyendo CFC-11 contenidos en las espumas, se examinaron como base para desarrollar el diseño del proyecto y su ámbito detallado. Se consideraron tres posibles opciones: i) exportación a instalaciones de gestión de desechos peligrosos acreditadas; ii) desarrollo de nuevas instalaciones nacionales utilizando tecnología importada; y iii) utilización de la capacidad nacional existe en materia de gestión de desechos peligrosos e industriales. La primera opción no se consideró debido a su costo elevado (11-12 $EUA/kg incluyendo costos de transporte y transacciones), así como aspectos relacionados con los reglamentos del

Convenio de Basilea en el país. La opción de desarrollar nuevas instalaciones en el país también se estudió, llegándose a la conclusión de que la inversión de capital necesaria era excesiva y que la capacidad de estas tecnologías no se adecuaba a las necesidades de Colombia.

13. La última opción entrañaba el examen de la posibilidad de utilizar instalaciones de incineración nacionales existentes con la condición de que éstas se ajustaran a las normas internacionales, lo que a su vez le permitiría destruir SAO. Se examinaron los actuales protocolos y normas vigentes en Colombia sobre permisos y calificaciones aplicados a las instalaciones de tratamiento térmico/incineración de desechos peligrosos. Se identificaron cuatro instalaciones como posiblemente capaces de destruir SAO en fin de vida útil sujeto a validación técnica mediante protocolos de ensayo. Una vez que estas instalaciones hayan demostrado satisfacer las normas internacionales, el Gobierno de Colombia opina que la utilización de la capacidad de destrucción nacional es más rentable que las otras opciones propuestas. Por consiguiente, la propuesta que se presenta está diseñada en torno a esa opción.

Supervisión y verificación de la destrucción

14. Para asegurarse de que todos los desechos de SAO están siendo adecuadamente contabilizados el proceso será supervisado estrechamente y se registrarán datos mediante un sistema de base de datos electrónicos que se establecerá con esos fines. El origen de todas las SAO en fin de vida útil recuperadas para su destrucción se determina fácilmente dado que las existencias actualmente disponibles están en poder de las fuentes originales y se recogen a partir de actividades bien definidas (es decir decomisos de aduana, actividades de servicio y mantenimiento de refrigeración y actividades de eliminación gradual tales como el proyecto de demostración de enfriadores, conversión de inhaladores de dosis medida y otros). Las SAO en fin de vida útil recuperadas durante la etapa inicial del programa nacional de sustitución de refrigeradores del mecanismo de responsabilidad extendida del productor se supervisarán estrechamente dado que son generadas en la fuente. En ambos casos, el seguimiento de estos materiales a través de la consolidación, caracterización, almacenamiento, transporte y destrucción subsiguientes se tiene en cuenta explícitamente en el proyecto incluyendo la documentación detallada y el uso de un sistema electrónico de supervisión de base de datos, que constituye parte de los resultados del proyecto. No hay riesgo de que existan volúmenes inflados o existencias que no son admisibles puesto que no hay instalaciones de producción en Colombia.

Costo del proyecto

15. El costo total del proyecto, en la forma originalmente presentada, se ha estimado en un valor de 2 750 000 $EUA y la suma solicitada a la Secretaría del Fondo Multilateral es de 1 195 000 $EUA según se indica en la tabla siguiente.

Tabla 2: Costo propuesto del proyecto

Presupuesto	**Costo ($EUA)**		
	Fondo Multilateral	**Cofinanciamiento***	**Total**
Componente 1: Demostración de destrucción de SAO	**835 000**	**1 235 000**	**2 070 000**
Consolidación/almacenamiento/caracterización/transporte de SAO en fin de vida útil de CFC-11 y CFC-12	100 000	50 000	150,000
Procesamiento manual de refrigeradores en locales de chatarra para producir 10-15t de espuma de CFC-11	100 000	-	100,000
Demostraciones de quemado de ensayo para CFC-11 y CFC-12 en incineradores seleccionados de desechos peligrosos	250 000	165 000	415 000
Demostraciones de quemado de ensayo para CFC-11 que contiene espuma en dos instalaciones de incineración seleccionadas de desechos industriales/peligrosos	140 000	80 000	220 000
Destrucción de volúmenes iniciales del programa de responsabilidad extendida del productor de CFC-12 y CFC-11 que	245 000	940 000	1 185 000

contiene espumas (basadas en 300,000 unidades, 34 t CFC-12, 65 t CFC-11 en 1 228 t de espuma)			
Componente 2: Asistencia técnica	**200 000**	**150 000**	**350 000**
Asistencia técnica institucional jurídica y normativa	50 000	25 000	75 000
Apoyo a la planificación técnica/administrativa para la gestión de SAO en fin de vida útil en el marco del sistema de responsabilidad extendida del productor	100 000	100 000	200 000
Consultas públicas e información	50 000	25 000	75 000
Componente 3: Gestión/supervisión/evaluación del proyecto	**160 000**	**170 000**	**330 000**
Coordinación nacional del proyecto	60 000	60 000	120 000
Administración de la oficina del proyecto	-	60 000	60 000
Servicios contractuales varios y viajes	20 000	20 000	40 000
Consultor internacional técnico/administrativo	50 000	-	50 000
Costos de supervisión y evaluación	30 000	30 000	60 000
Total	**1 195 000**	**1 555 000**	**2 750 000**

*De empresas privadas y explotadores de incineradores.

OBSERVACIONES Y RECOMENDACIÓN DE LA SECRETARÍA

OBSERVACIONES

16. La Secretaría envió al PNUD varios comentarios y observaciones basados en el examen realizado siguiendo los criterios establecidos en la decisión 58/19. Tomó nota de que la base para el sistema de acopio de desechos de SAO constituye una política que se encuentra en su etapa final de aprobación por el Parlamento y expresó su preocupación respecto de otras opciones si la reglamentación no se aprueba. El PNUD explicó que el Ministerio de Ambiente y Desarrollo Sostenible, en caso de que esto suceda, emitirá un decreto ministerial que exigirá el acopio de desechos de SAO del número objetivo de 300 000 refrigeradores, que es parte de este proyecto piloto. No obstante, el Ministerio es muy optimista en el sentido de que la legislación propuesta se aprobará en la próxima sesión del Parlamento prevista para el primer trimestre de 2012.

17. La Secretaría también planteó preocupaciones sobre los aspectos logísticos del desmantelamiento de los refrigeradores domésticos en el marco del programa de equipos eléctricos y electrónicos de desecho. El PNUD indicó que hay varias compañías involucradas y varias más interesadas en el proceso de desmantelamiento y que están ubicadas en ciudades importantes a través del país. La estructura descentralizada del desmantelamiento manual también facilita su funcionamiento logístico. El precio del metal de chatarra y otros materiales recuperados es bastante elevado; por consiguiente, las operaciones de desmantelamiento así como el acopio de desechos de SAO son autosostenibles.

18. La Secretaría también pidió aclaraciones sobre por qué era necesario realizar los ensayos en tres incineradores en vez de solo en uno con carácter piloto. El PNUD indicó que la selección de estas instalaciones se basó en criterios muy estrictos aplicados por el Gobierno para mostrar los diferentes aspectos de la destrucción. Dado que el proceso abarcará el CFC-12, que es una sustancia gaseosa, y el CFC-11 en su fase líquida, los hornos giratorios de alta temperatura deberán ensayarse y certificarse para este proceso. El procedimiento involucrará un quemado de ensayo de CFC-12 en su fase gaseosa, quemado de ensayo de CFC-11 en su fase líquida y un quemado de ensayo de CFC-11 en su fase sólida/gaseosa (en la espuma). El uso de estas tres instalaciones proporcionaría una amplia gama de capacidad técnica que permitiría al país avanzar con la estrategia de utilizar estas instalaciones nacionales para destrucción de SAO. El PNUD también hizo hincapié en que estas instalaciones del proyecto piloto no procuran obtener inversiones de capital del Fondo Multilateral. Las modificaciones técnicas se llevarán

a cabo en cada instalación por su propia cuenta, como parte de la cofinanciación. La propuesta se concentrará en los resultados de los ensayos, certificación y registro de los protocolos de ensayo.

19. En ulteriores debates con el PNUD, la Secretaría propuso que un resultado importante del proyecto cuya demostración resultaría útil sería la producción de un informe o manual técnico que documente las etapas y resultados alcanzados por el protocolo de ensayo, la forma en que se realizaron los quemados de ensayo, la forma en que se emprendió la validación técnica, el modo en que las instalaciones se mejoraron y los costos involucrados. Sugirió además que este informe podría utilizarse posteriormente para procedimientos de ensayos similares en instalaciones de incineración similares no sólo en el país sino también en otros países al amparo del Artículo 5 y también constituirá un resultado vital del proyecto de demostración. El PNUD tomó en cuenta a lo anterior y ajustó el presupuesto en consecuencia.

20. La Secretaría también planteó interrogantes respecto de la sostenibilidad del proyecto después de haberse completado la fase experimental. La propuesta indicaba claramente que una vez realizados los ensayos de estas instalaciones y haberse cumplido normas aceptables para la destrucción, las instalaciones continuarían funcionando por su cuenta. No obstante, no quedaba en claro quién sería en última instancia responsable de sufragar los costos de destrucción de los desechos de SAO remanentes una vez completado el proyecto experimental. El PNUD explicó que el proyecto experimental abarca solamente la fase inicial en la cual se financiarán una pequeña porción de los costos de destrucción, no obstante, los costos futuros serán abarcados enteramente por el programa de equipo eléctrico y electrónico de desecho/responsabilidad extendida del productor y los ingresos que éste genere. Estas instalaciones tienen un incentivo económico para asegurar una destrucción racional desde el punto de vista del medio ambiente de las SAO en fin de vida útil recuperadas de dicho programa como desechos peligrosos reglamentados. El financiamiento proporcionado por el Fondo Multilateral para los ensayos es una condición de un programa de apoyo para las empresas que recogen y desmantelan el equipo de refrigeración. A largo plazo, se prevé que dicha destrucción también puede atraer ingresos financieros para actividades sobre el carbono, aunque esto no se considere esencial en Colombia por el momento, dado que pueden mantenerse las proyecciones actuales para un sistema basado en el desmantelamiento manual.

21. El costo final del proyecto se convino en la forma presentada por un valor de 1 195 000 $EUA más los costos de apoyo, calculados en 10,48 $EUA/kg, suma inferior al umbral de 13,2 $EUA/kg indicado en la decisión 58/19. Se incluyeron modificaciones a los resultados y costos para incluir sugerencias planteadas por la Secretaría según se resume en la tabla siguiente:

Tabla 3: Costos convenidos del proyecto

Presupuesto	**Costo ($EUA)**
Componente 1: Demostración de destrucción de SAO	**830 000**
Consolidación/almacenamiento/caracterización/transporte de SAO en fin de vida útil de CFC-11y CFC-12	100 000
Consolidación/almacenamiento/caracterización/transporte de CFC-11 que contiene espuma para demostraciones de quemado de ensayo	100 000
Demostraciones de quemado de ensayo para CFC-11 y CFC-12 en incineradores seleccionados de desechos peligrosos	250 000
Demostraciones de quemado de ensayo para CFC-11 que contiene espuma en dos instalaciones de incineración seleccionadas de desechos industriales/peligrosos	135 000
Destrucción de volúmenes iniciales del programa de responsabilidad extendida del productor de CFC-12 y CFC-11 que contiene espumas (basadas en 300,000 unidades, 34 t CFC-12, 65 t CFC-11 en 1 228 t de espuma)	245 000

Componente 2: Asistencia técnica	**255 000**
Asistencia técnica institucional jurídica y normativa	50 000
Apoyo a la planificación técnica/administrativa para la gestión de SAO en fin de vida útil en el marco del sistema de responsabilidad extendida del productor	75 000
Consultas públicas e información	50 000
Vigilancia técnica e informe técnico general sobre el proyecto	80 000
Componente 3: Gestión/supervisión/evaluación del proyecto	**110 000**
Coordinación nacional del proyecto	60 000
Administración de la oficina del proyecto	-
Servicios contractuales varios y viajes	50 000
TOTAL	**1 195 000**

RECOMENDACIÓN

22. El Comité Ejecutivo podría considerar:

a) Tomar nota con beneplácito de la presentación del Gobierno de Colombia de un proyecto experimental sobre gestión y eliminación de desechos de SAO con miras a destruir un total de 114 toneladas métricas de desechos de SAO; y

b) Aprobar la ejecución de un proyecto experimental sobre gestión y destrucción de desechos de SAO en Colombia por una suma de 1 195 000 $EUA, más los costos de apoyo de 89 625 $EUA para el PNUD, en la inteligencia de que no habrán otros fondos disponibles para Colombia para cualquier proyecto de eliminación de desechos de SAO en el futuro.

HOJA DE EVALUACIÓN DE PROYECTO – PROYECTOS PLURIANUALES

Colombia

(I) TÍTULO DEL PROYECTO	ORGANISMO
Plan de gestión de eliminación de HCFC (etapa I)	PNUD (director)

(II) DATOS MÁS RECIENTES CON ARREGLO AL ARTÍCULO 7 (Anexo C Grupo I)	Año: 2010	241,5 (toneladas PAO)

(III) DATOS SECTORIALES DEL PROGRAMA DE PAÍS MÁS RECIENTES (toneladas PAO)								Año: 2010	
Sustancia química	Aerosol	Espuma	Lucha contra incendios	Refrigeración		Solventes	Agente de procesos	Uso en laboratorio	Consumo total del sector
				Fabricación	Mantenimiento				
HCFC-123			2,3		0,0				2,3
HCFC-124					0,0				0,0
HCFC-141b	0,6	160,1	4,1		5,6	0,6			171,1
HCFC-142b					0,6				0,6
HCFC-22	0,2	7,6		3,2	56,4				67,4

(IV) DATOS SOBRE EL CONSUMO (toneladas PAO)			
Nivel básico 2009 - 2010:	225,57	Punto de partida para la reducción acumulativa sostenida:	225,57
CONSUMO ADMISIBLE PARA LA FINANCIACIÓN (toneladas PAO)			
Ya aprobado:	79.40	Remanente:	146,17

(V) PLAN ADMINISTRATIVO		2011	2012	2013	2014	Total
PNUD	Eliminación de SAO (toneladas PAO)		10,5		2,9	13,4
	Financiación ($EUA)		591 250		161 250	752 500
PNUMA	Eliminación de SAO (toneladas PAO)		1,0			1,0
	Financiación ($EUA)		56 500			56 500

(VI) DATOS DEL PROYECTO			2010	2011	2012	2013	2014	2015	Total
Límites de consumo del Protocolo de Montreal			n/a	n/a	n/a	225 57	225 57	203 01	n/a
Consumo máximo permitido (toneladas PAO)			n/a	n/a	n/a	225 57	225 57	203 01	n/a
Financiación convenida ($EUA)	PNUD	Costos del proyecto	6 021 483	0	550 000	0	150 000	0	6 721 483
		Costos de apoyo	451 611	0	41 250	0	11 250	0	504 111
	PNUMA	Costos del proyecto	50 000	0	50 000	0	0	0	100 000
		Costos de apoyo	6 500	0	6 500	0	0	0	13 000
Fondos aprobados por el Comité Ejecutivo ($EUA)		Costos del proyecto	6 071 483	0	0	0	0	0	6 071 483
		Costos de apoyo	458 111	0	0	0	0	0	458 111
Total de fondos solicitados para aprobación en esta reunión ($EUA)		Costos del proyecto	0	0	600 000	0	0	0	600 000
		Costos de apoyo	0	0	47 750	0	0	0	47 750

Recomendación de la Secretaría:	Para consideración individual

DESCRIPCIÓN DEL PROYECTO

23. En nombre del Gobierno de Colombia, el PNUD, en su calidad de organismo director, ha presentado a la 66ª Reunión del Comité Ejecutivo una solicitud de financiación para el segundo tramo de la etapa I del plan de gestión de eliminación de HCFC por un total de 647 750 $EUA, desglosado en 550 000 $EUA más costos de apoyo al organismo por un monto de 41 250 $EUA para el PNUD y 50 000 $EUA más costos de apoyo al organismo por un monto de 6 500 $EUA para el PNUMA. La presentación comprende un informe sobre la marcha de las actividades de la ejecución del primer año del plan de gestión de eliminación de HCFC, conjuntamente con un informe de verificación sobre el consumo de HCFC en Colombia, así como los planes anuales de ejecución para 2012 y 2013.

Antecedentes

24. El plan de gestión de eliminación de HCFC para Colombia fue aprobado por el Comité Ejecutivo en su 62ª Reunión,con el fin de reducir el consumo de HCFC en un 10% del nivel básico para fines de 2014, con una financiación total, en principio, de 6 821 483 $EUA, más costos de apoyo al organismo por valor de 517 111 $EUA. Esto incluía 5 621 483 $EUA más costos de apoyo al organismo por un monto de 421 611 $EUA para el PNUD aprobados en la 60ª Reunión con el fin de eliminar 56,00 toneladas PAO de HCFC-22 y HCFC-141b utilizados en la producción de espuma aislante en el subsector de refrigeración doméstica. También en la 62ª Reunión, el Comité Ejecutivo aprobó 400 000 $EUA, más costos de apoyo al organismo por un monto de 30 000 $EUA para el PNUD y 50 000 $EUA, más costos de apoyo al organismo por un monto de 6 500 $EUA para el PNUMA para la ejecución del primer año del plan de gestión de eliminación de HCFC.

<u>Informe sobre la marcha de las actividades de la ejecución del primer tramo del plan de gestión de eliminación de HCFC</u>

25. La ejecución de proyecto para la conversión de HCFC-22 y HCFC-141b a hidrocarburos en la producción de espuma para aislamientos en el subsector de refrigeradores de uso doméstico por parte de las empresas fabricantes, concretamente, Mabe Colombia, Industrias Haceb, S.A., Challenger and Indusel S.A., está bien avanzada. Se concertaron memorandos de entendimiento entre cada una de las empresas y el Ministerio de Ambiente y Desarrollo Sostenible, indicando las responsabilidades específicas de cada participantes, los criterios para los pagos de financiación y los informes de verificación. En los casos de las Industrias Haceb y Challenger, ambas empresas ya han instalado el equipo necesario y están realizando actualmente ensayos de producción. Se espera que la producción libre de HCFC pueda comenzar en 2012. En el caso de Mabe Colombia, el equipo requerido para la conversión se instalará para octubre de 2012 y los ensayos se realizarán durante el último trimestre de ese año, iniciándose la producción libre de HCFC a partir de enero de 2013. El equipo necesario para Indusel se está fabricando y se entregará e instalará en el último trimestre de 2012. Se prevé que la producción libre de HCFC comenzará en el primer trimestre de 2013.

26. Las siguientes actividades se han llevado a cabo en el sector de servicio y mantenimiento de refrigeración y aire acondicionado:

a) Ha comenzado el programa de formación y certificación de técnicos en refrigeración y aire acondicionado y ya se han certificado 312 técnicos. Se realizaron tres talleres sobre buenas prácticas de servicio y mantenimiento con la participación de 130 técnicos que recibieron capacitación en operaciones de recuperación y reciclaje, un manejo seguro de refrigerantes basados en hidrocarburos e implantación del Protocolo de Montreal en Colombia. Se celebró en noviembre de 2011 una reunión con 43 instructores en refrigeración sobre seguridad industrial relativa al uso de refrigerantes de alternativa;

b) Se realizaron seminarios sobre refrigerantes de alternativa con bajo potencial de calentamiento global para 170 representantes de talleres de mantenimiento de refrigeración y aire acondicionado así como usuarios finales;

c) Se proporcionó asistencia técnica a los talleres de servicio y mantenimiento en todo el país para orientarles en la aplicación de buenas prácticas de servicio en la instalación y mantenimiento de sistemas de refrigeración y aire acondicionado, refrigerantes de alternativa y eliminación segura de SAO;

d) La Dependencia Nacional del Ozono visitó 31 establecimientos comerciales para recoger información detallada sobre los refrigerantes basados y no basados en SAO actualmente disponibles en el país. Estas visitas también contribuyeron a prevenir y controlar el comercio ilegal de SAO;

e) Para la eliminación del HCFC-141b en el lavado por inyección de circuitos de refrigeración, se ha llevado a cabo una evaluación de metodologías alternativas con miras a adquirir los equipos de servicio y mantenimiento. Se han preparado los términos de referencia para la selección de los 165 beneficiarios incluidos en la etapa I;

f) Se han elaborado términos de referencia para el equipo que se ha de adquirir a efectos de fortalecer la red de recuperación, reciclaje y regeneración de refrigerantes establecida durante la eliminación gradual de CFC.

27. Al 31 de enero de 2012, de los 6 071 483 $EUA aprobados para el primer tramo, se habían desembolsado o comprometido 2 523 251 $EUA. El saldo de 3 548 232 $EUA se desembolsará en 2012.

Informe de verificación

28. Un auditor independiente llevó a cabo la verificación del consumo de HCFC en 2010. El informe llegó a la conclusión de que “los datos de 2010 sobre importación de SAO notificados por la Dependencia Nacional del Ozono son totalmente fiables y que Colombia está alcanzando sus objetivos sobre consumo interno según lo convenido”. El informe de verificación también recomendó evaluar la posibilidad de establecer sanciones eficaces para aquellos que violan los reglamentos de importación de SAO, informar a los ciudadanos sobre la confiscación de SAO ilegales como mecanismo para difundir las restricciones existentes a su comercialización y transformar la página web de la Dependencia Nacional del Ozono en un sistema de información sobre el Protocolo de Montreal.

Planes anuales para el segundo tramo del plan de gestión de eliminación de HCFC

29. En el Cuadro 1 se presentan las principales actividades que han de ejecutarse entre 2012 y 2014.

Cuadro 1. Actividades de eliminación que han de ejecutarse entre 2012 y 2014 en Colombia

Resultados previstos	**Actividades propuestas**	**Costo ($EUA)**
Plena conversión de las empresas fabricantes de espumas con eliminación completa de HCFC para 2013	Eliminación gradual de HCFC utilizados en la fabricación de espuma aislante en el sector de refrigeradores de uso doméstico	
Reducción del consumo de HCFC en el sector de refrigeración y aire acondicionado	Consolidación y ampliación de la red de recuperación, reciclaje y regeneración	80 000
	Capacitación y certificación de técnicos en refrigeración y aire acondicionado	235 000
	Asistencia técnica para el sector de servicio y mantenimiento de refrigeración de aire acondicionado y usuarios finales	44 000
	Eliminación de HCFC-141b en las actividades de lavado por inyección de los circuitos de refrigeración	25 000
Eliminación del consumo de HCFC-141b y HCFC-22 en usos de emisiones	Asistencia técnica para la eliminación de HCFC-141b utilizado como solvente en la fabricación de agujas hipodérmicas	63 000
	Asistencia técnica para la eliminación de HCFC-141b utilizado como agente de limpieza del equipo electrónico	
	Asistencia técnica para la eliminación de HCFC-22 en el sector de aerosoles	
Fortalecimiento de las instituciones para formulación y aplicación de políticas sobre eliminación de HCFC	Fortalecimiento del marco normativo de la eliminación de HCFC	45 000
	Mejora del control del comercio en HCFC y equipos basados en HCFC	50 000*
	Educación, difusión de información e incremento de la concientización sobre el medio ambiente	30 000
Fortalecimiento del equipo técnico para ejecución y supervisión del plan de gestión de eliminación de HCFC	Ejecución, supervisión y evaluación de los planes anuales de operación	28 000
Total		600 000

(*) A ejecutar por el PNUMA.

OBSERVACIONES Y RECOMENDACIÓN DE LA SECRETARÍA

OBSERVACIONES

Consumo de HCFC

30. El consumo básico de HCFC para cumplimiento se ha establecido en 225,57 toneladas PAO, sobre la base del consumo real notificado en el marco del Artículo 7 del Protocolo de Montreal para 2009 y 2010 según se indica en el Cuadro 2. El consumo básico establecido es de 2,17 toneladas PAO mayor que las 223,40 toneladas PAO estimadas en el momento de aprobarse el plan de gestión de eliminación de HCFC para Colombia.

Cuadro 2 Consumo de HCFC en Colombia (Artículo 7)

HCFC	2006	2007	2008	2009	2010	Básico
Toneladas métricas						
HCFC-22	1 147,17	855,16	1 221,20	1 358,99	1 226,19	1 292,59
HCFC-141b	871,69	1 431,58	1 250,36	1 203,48	1 555,44	1 379,46
HCFC-142b	-	1,01	0,86	5,39	9,61	7,50
HCFC-123	77,90	77,40	73,69	106,39	114,40	110,40
HCFC-124	-	2,33	0,14	2,88	0,68	1,78
Total (mt)	2 096,76	2 367,48	2 546,25	2 677,13	2 906,32	2 791,73
Toneladas PAO						
HCFC-22	63,09	47,03	67,17	74,74	67,44	71,09
HCFC-141b	95,89	157,47	137,54	132,38	171,10	151,74
HCFC-142b	-	0,07	0,06	0,35	0,62	0,49
HCFC-123	1,56	1,55	1,47	2,13	2,29	2,21
HCFC-124	-	0,05	0,00	0,06	0,01	0,04
Total (toneladas PAO)	160,54	206,17	206,24	209,67	241,47	225,57

31. Tomando nota de que se propuso completar la conversión de las cuatro empresas de fabricación para diciembre de 2013, y dado el carácter avanzado de la etapa de ejecución del proyecto, la Secretaría preguntó sobre la viabilidad de lograr la conversión en una fecha más temprana. El PNUD explicó que la parte técnica de la conversión quedará finalizada a principios de 2013; no obstante, la verificación de la producción de equipo de refrigeración no basado en HCFC y las importaciones de HCFC-141b y HCFC-22 se llevarán a cabo durante el resto de 2013.

32. Con respecto a las recomendaciones al Gobierno de Colombia presentadas en el informe de verificación, el PNUD indicó que la Dependencia Nacional del Ozono incluía en sus actividades la realización de talleres con funcionarios aduaneros y establecimientos comerciales sobre el comercio ilegal y la confiscación de SAO en el segundo tramo de la etapa I del plan de gestión de eliminación de HCFC. La Dependencia Nacional del Ozono también realizará un seguimiento con la Oficina de aduanas a efectos de evaluar la posibilidad de establecer sanciones al comercio ilegal de SAO. El sitio web de la Dependencia Nacional del Ozono ya incluye información sobre proyectos de eliminación de HCFC que se han elaborado y que actualmente se están ejecutando. Además, en dicho sitio web figuran publicaciones sobre SAO que se han preparado.

Revisión del acuerdo sobre el plan de gestión de eliminación de HCFC

33. El plan de gestión de eliminación de HCFC para Colombia se aprobó antes del establecimiento del consumo básico de HCFC para cumplimiento. Por consiguiente, al aprobar el plan de gestión de eliminación de HCFC, el Comité Ejecutivo pidió a la Secretaría que, entre otras cosas, actualizara el Apéndice 2-A ("Los objetivos y la financiación") del Acuerdo para incluir las cifras relativas al consumo máximo admisible y que notificara al Comité los niveles resultantes en consecuencia (decisión 62/55 e)).

Sobre la base de los datos notificados por el Gobierno de Colombia en el marco del Artículo 7 y su calendario de eliminación revisado, se han actualizado los párrafos pertinentes del Acuerdo y se ha añadido un nuevo párrafo para indicar que el Acuerdo actualizado sustituye al alcanzado en la 62ª Reunión, según se muestra en el Anexo I a este documento. El Acuerdo revisado completo se adjuntará al informe final de la 66ª Reunión.

RECOMENDACIÓN

34. El Comité Ejecutivo podría considerar lo siguiente:

a) Tomar nota del informe sobre la marcha de las actividades en la ejecución del primer tramo de la etapa I del plan de gestión de eliminación de HCFC en Colombia;

b) Tomar nota de que la Secretaría del Fondo ha actualizado el párrafo 1, el Apéndice 1-A "Las sustancias" y el Apéndice 2-A: "Los objetivos y la financiación" del Acuerdo entre el Gobierno de Colombia y el Comité Ejecutivo, con arreglo al nivel básico de consumo de HCFC establecido para cumplimiento, y de que se ha añadido un nuevo párrafo 16 para indicar que el Acuerdo actualizado sustituye al Acuerdo alcanzado en la 62ª Reunión, según figura en el Anexo I al presente documento;

c) Tomar nota de que el punto de partida revisado para la reducción acumulada sostenida del consumo de HCFC es de 225,57 toneladas PAO, calculadas utilizando el consumo real de 209,67 toneladas PAO y 241,47 toneladas PAO notificado para 2009 y 2010, respectivamente, con arreglo al Artículo 7 del Protocolo de Montreal; y

d) Aprobar el segundo tramo de la etapa I del plan de gestión de eliminación de HCFC de Colombia, y los correspondientes planes anuales de ejecución, por un monto de 647 750 $EUA, desglosados en 550 000 $EUA, más costos de apoyo al organismo por un monto de 41 250 $EUA para el PNUD, y 50 000 $EUA, más costos de apoyo al organismo por un monto de 6 500 $EUA para el PNUMA.

Anexo I

TEXTO QUE HA DE INCLUIRSE EN EL ACUERDO ACTUALIZADO ENTRE EL GOBIERNO DE COLOMBIA Y EL COMITÉ EJECUTIVO DEL FONDO MULTILATERAL PARA LA REDUCCIÓN DEL CONSUMO DE LOS HCFC

(Los cambios pertinentes se presentan en **negrita** para facilitar la referencia)

1. El presente Acuerdo representa el entendimiento a que han llegado el Gobierno de Colombia (el "País") y el Comité Ejecutivo respecto a la reducción del uso controlado de las sustancias que agotan la capa de ozono (SAO) indicadas en el Apéndice 1-A (las "Sustancias") antes del 1 de enero de 2015, en cumplimiento de los calendarios del Protocolo de Montreal, hasta un nivel sostenido de **203,01** toneladas PAO que representa un consumo máximo permitido para el año 2015 conforme al calendario de reducción del Protocolo de Montreal.

16. Este Acuerdo actualizado sustituye al Acuerdo alcanzado entre el Gobierno de Colombia y el Comité Ejecutivo en la 62ª reunión del Comité Ejecutivo.

APÉNDICE 1-A: LAS SUSTANCIAS

Sustancia	Anexo	Grupo	Punto de partida para las reducciones acumuladas de consumo (toneladas PAO)
HCFC-22	C	I	**71,09**
HCFC-141b	C	I	**151,74**
HCFC-142b	C	I	**0,49**
HCFC-123	C	I	**2,21**
HCFC-124	C	I	**0,04**
Total			**225,57**

APÉNDICE 2-A: LOS OBJETIVOS Y FINANCIACIÓN

Fila	Detalles	2010	2011	2012	2013	2014	2015	Total
1.1	Calendario de reducción del Protocolo de Montreal del Anexo C, Grupo I sustancias (toneladas PAO)	n/a	n/a	n/a	**225,57**	**225,57**	**203,01**	n/a
1.2	Consumo total máximo permitido de consumo de sustancias del Grupo I del Anexo C (toneladas PAO)	n/a	n/a	n/a	**225,57**	**225,57**	**203,01**	n/a
2.1	Financiación convenida para el Organismo de Ejecución Principal [PNUD] ($EUA)	6 021,483 *	0	550,000	0	150,000		6 721,483
2.2	Costos de apoyo para el Organismo de Ejecución Principal ($EUA)	451,611 *	0	41,250	0	11,250	0	504,111
2.3	Financiación convenida para el Organismo de Ejecución Cooperante [PNUMA] ($EUA)	50,000	0	50,000	0	0	0	100,000
2.4	Costos de apoyo para el Organismo de Ejecución Cooperante ($EUA)	6,500	0	6,500	0	0	0	13,000
3.1	Financiación total convenida ($EUA)	6 071,483	0	600,000	0	150,000	0	6 821,483
3.2	Costo total de apoyo al proyecto ($EUA)	458,111	0	47,750	0	11,250	0	517,111
3.3	Total costos convenidos ($EUA)	6 529,594	0	647,750	0	161,250	0	7 338,594
4.1.1	Eliminación total convenida de HCFC-22 por lograr conforme a este acuerdo (toneladas PAO)							15,17
4.1.2	Eliminación de HCFC-22 por lograr en proyectos aprobados anteriormente (toneladas PAO)							9,82
4.1.3	Consumo admisible remanente de HCFC-22 (toneladas PAO)							**46,10**
4.2.1	Eliminación total convenida de HCFC-141b por lograr conforme a este acuerdo (toneladas PAO)							7,72
4.2.2	Eliminación de HCFC- por lograr en proyectos aprobados anteriormente (toneladas PAO)							46,20
4.2.3	Consumo admisible remanente de HCFC-141b (toneladas PAO)							**97,82**
4.3.1	Eliminación total convenida de HCFC-123 por lograr conforme a este acuerdo (toneladas PAO)							0
4.3.2	Eliminación de HCFC-123 por lograr en proyectos aprobados anteriormente (toneladas PAO)							0
4.3.3	Consumo admisible remanente de HCFC-123 (toneladas PAO)							**2,21**
4.4.1	Eliminación total convenida de HCFC-142b por lograr conforme a este acuerdo (toneladas PAO)							0
4.4.2	Eliminación de HCFC-142b por lograr en proyectos aprobados anteriormente (toneladas PAO)							0
4.4.3	Consumo admisible remanente de HCFC-142b (toneladas PAO)							**0,49**
4.5.1	Eliminación total convenida de HCFC-124 por lograr conforme a este acuerdo (toneladas PAO)							0
4.5.2	Eliminación de HCFC-124 por lograr en proyectos aprobados anteriormente (toneladas PAO)							0
4.5.3	Consumo admisible remanente de HCFC-124 (toneladas PAO)							**0,04**

* En la 60ª reunión se aprobaron 5 621 483 $EUA más unos costos de apoyo al organismo de 421 611 $EUA para el PNUD a los efectos de la eliminación de los HCFC utilizados en la producción de espumas aislantes rígidas de poliuretano en el subsector de refrigeradores domésticos.

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Project Document

Government of Colombia

United Nations Development Programme

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

Demonstration Project on "End of Life" ODS Management and Destruction

March 2012

COUNTRY:	**Colombia** **IMPLEMENTING AGENCY: UNDP**
PROJECT TITLE:	**Demonstration Project on End of Life ODS Management and Destruction**

PROJECT IN CURRENT BUSINESS PLAN:	**Yes**
SECTOR:	**ODS-Waste**
Sub-Sector:	**Refrigeration Servicing Sector**
PROJECT IMPACT (ODP targeted):	**114 Tonnes/year of CFC-12**
PROJECT DURATION:	**36 months**
PROJECT COSTS:	**US$ 2,750,000**
LOCAL OWNERSHIP:	**100 %**
EXPORT COMPONENT:	**0 %**
REQUESTED MLF GRANT:	**US$1,195,000**
IMPLEMENTING AGENCY SUPPORT COST:	**US$ 89,625 (7.5 %)**
TOTAL COST OF PROJECT TO MLF:	**US$ 1,284,625**
COST-EFFECTIVENESS:	**11.26 US$ /kg ODS (metric) based on complete destruction of currently available end of life (EOL) ODS stocks in Colombia (15 Tons), and an anticipated 65 Tons of CFC-11 and 34 Tons of CFC-12 recovered over the first two years of implementation of the national refrigerator replacement program undertaken in accordance with WEEE legislation now being enacted. An annual estimated destruction rate of 56 Tons of CFC-11 and 29 tons of CFC-12 is projected beyond the project life.**
PROJECT MONITORING MILESTONES:	**Included**
NATIONAL COORDINATING AGENCY:	**Ozone Technical Unit (UTO) within the Division of Sectorial and Urban Environmental Affairs in the Ministry of Environment and Sustainable Development (MADS)**

Brief Description.

The Ozone Technical Office of the Ministry of Environment and Sustainable Development in collaboration with UNDP has developed a project to demonstrate the environmentally sound, efficient and cost effective disposal of ODS refrigerants and blowing agents recovered from early retired refrigerators, from the servicing sectors and from some of the MLF investment and demonstration projects as part of broader national programs related to energy efficiency and the sustainable management of hazardous wastes and WEEE.

The project utilizes an existing stock of "end of life" ODS to qualify three domestic, modern, high temperature hazardous waste temperature incineration facilities to international standards. The project covers both the destruction of CFC-12 refrigerant and CFC-11 blowing agent, the latter in both pure form and contained in PU foam. Under the project, these facilities, as qualified, will destroy a more substantial quantity of EOL ODS that will be generated during the start phase of the above refrigerator replacement program now starting implementation. The

option of demonstrating destruction capability on such domestic facilities has been selected on the basis of it being the most cost effective route for Colombia relative other options available.

In terms of overall global demonstration value, the project offers a cost effect demonstration of what a middle income, industrializing Article 5 country can practically achieve in relation to EOL ODS destruction by integrating it into broader hazardous waste and WEEE management programs and energy efficiency initiatives while capitalizing on emerging domestic environmental management capability. It will also serves to demonstrate synergy with other multi-lateral international programs particularly management of POPs stockpiles and wastes, and contributes to the knowledge base on current issues under discussion by TEAP.

1. INTRODUCTION AND BACKGROUND.

In recent years it has become generally recognized that a significant bank of ODS remains in use, mainly as refrigerants and in foams, and that this ODS will be subject to atmospheric release at some point at the end of its useful life. As a consequence, the Parties to the Montreal Protocol have directed attention to the issue, particularly in developing countries where the major remaining banks of high ODP ODS (i.e. CFCs and halons) remain. Under Decision XX/7[1], the Parties requested ExCom to consider supporting demonstration initiatives in Article 5 countries as well as requesting TEAP to update its earlier guidance on ODS destruction[2] as adopted by the Parties[3]. In recognition of this, ExCom Decision 58/17[4] approved a set of interim guidelines for the funding of demonstration projects for the disposal of ODS and agreed that the Multi-lateral Fund (MLF) will fund demonstration projects. Preparation funding for a number of such projects, including the current project proposed in Colombia were subsequently approved at ExCom 59[5] (ExCom Decision 59/19). TEAP has also updated its guidance on destruction requirements and approved technologies for ODS destruction with inclusion of a current Task Force Report in its most recent Progress Report[6].

Currently, there are several demonstration projects under preparation or implementation worldwide using MLF funding. Additionally, it is understood that the Global Environmental Facility in its capacity as the financial mechanism for ODS in Countries with Economies in Transition (CEITs) is considering a parallel program on ODS destruction. Overall it is apparent that experience with a variety of ODS destruction technologies, program/business models will be accumulated over the next several years that can serve as a basis for future decision making and action on the issue by both countries and collectively by the Parties.

In this proposal, the Government of Colombia is requesting funding for a project to demonstrate and evaluate the safe disposal and environmentally sound destruction of "end of life" (EOL) ODS, the need for which is becoming increasingly apparent. Stocks of EOL ODS have begun to accumulate in the country from its now operational recovery, recycling and reclaim system and targeted phase out initiatives resulting in unused inventories and replaced refrigerant. The country's aggressive regulatory efforts are now preventing the release of this material and it is accumulating in secure storage as a regulated hazardous waste, something that is anticipated to steadily increase. Of greater long term significance is the anticipated dramatic growth in the immediate future with implementation of a program replacing domestic refrigerators as part of adopted national programs related to energy efficiency and management of waste electrical and electronic equipment (WEEE). The absence of cost effective demonstrated destruction capability represents a significant gap in that process and a barrier to its implementation.

[1] Montreal Protocol Handbook (8th Edition, 2009), Page 90 - http://ozone.unep.org/Publications/MP_Handbook/MP-Handbook-2009.pdf
[2] TEAP Task Force on Destruction Technologies Report – 2002 (Volume 3b of 2002 TEAP Report) - http://ozone.unep.org/Assessment_Panels/TEAP/Reports/Other_Task_Force/TEAP02V3b.pdf
[3] Montreal Protocol Handbook (8th Edition, 2009), Page 457-464 - http://ozone.unep.org/Publications/MP_Handbook/MP-Handbook-2009.pdf
[4] http://www.multilateralfund.org/sites/58th/Document%20Library2/1/5853.pdf
[5] http://www.multilateralfund.org/sites/59/Document%20Library2/1/5959.pdf
[6] May 2011 TEAP Progress Report – P65, http://ozone.unep.org/Assessment_Panels/TEAP/Reports/TEAP_Reports/TEAP_Progress_Report_May_2011.pdf

From the perspective of the MLF, ExCom and the Parties generally, the proposed project provides an opportunity within the overall global ODS destruction demonstration program to support the practical implementation of ODS destruction using existing domestic capacity as an integrated part of broader national environmental and sustainable development programs utilizing various economic instruments such as Extended Producer Responsibility (EPR) applied to a WEEE management program, energy efficiency incentives and potentially carbon financing, all undertaken in a medium size industrializing Article 5 country. The project will also serve to address several technical issues that have been raised in recent TEAP discussions and add to the technical knowledge base related to environmental performance requirements applied to ODS destruction. Finally, the project's timing affords an opportunity to achieve synergies with a Global Environmental Facility (GEF) project addressing elimination of PCB waste stockpiles and which would be implemented in parallel and under common institutional supervision.

2. PROJECT CONTEXT AND BACKGROUND

Colombia has been an active Party to the Montreal Protocol as an Article 5 country, having acceded to the Vienna Convention and Montreal Protocol in 1990 and 1993 respectively and subsequently to all amendments. Institutionally, the management of ODS issues within the government is assigned to the Division of Sectorial and Urban Environmental Affairs in the Ministry of Environment and Sustainable Development (MADS). Within the division, the Country maintains an Ozone Technical Unit (UTO) that has direct operational control responsibility for the ODS issue. The legislative and regulatory base developed and in force respecting ODS and the Montreal Protocol is summarized in Appendix 2.

Within the Division of Sectorial and Urban Environmental Affairs there are also units having responsibility for waste management generally and specifically hazardous waste which under Colombian legislation includes waste or EOL ODS. This institutional linkage is of importance to this project because it is coordinating national initiatives related to waste diversion, recycling and resource recovery including the planned WEEE program which includes refrigeration equipment, hence the capture and environmental sound management of refrigerants and foam plowing agents.

Since the mid 1990's but most aggressively since 2000, Colombia has been pursuing the phase out of Annex A and B substances, something that was achieved accordance with its obligations in 2010 for new consumption manufacturing applications, notably in domestic and commercial refrigeration, foam and solvent sectors. Similarly, Colombia has banned the imports of Methyl Bromide for non QPS purposes since 1996. The country has also developed a strong national refrigeration servicing sector operated by a network of well equipped technicians and private sector companies with 572 refrigerant recovery equipment sets distributed in recycling centers and 5 reclaim centers. The country is currently completing a number of Annex A and B substance final phase out initiatives including; i) a chiller demonstration project involving the elimination of CFC-11 at installations in the country in 2012-13; ii) Replacement of CFC-11 and CFC-12 at a medical aerosol manufacturer in Bogota (LABORATORIO CHALVER); and iii) elimination of CTC process agent used in Cali (QUIMPAC). Additionally, the country has also

initiated work on its HPMP with MLF support and anticipates an accelerated phase out program for HCFCs.

One consequence of the above work associated with Annex A and B ODS phase out all coupled with a strong regulatory control function is the generation of a stock of EOL ODS. The principal sources are: i) unusable CFC-12 and other HCFC and HFC based refrigerants from recycling and reclaim activities, noting that it is also anticipated that as the stocks of remaining CFC based equipment is retired, an excess of recovered higher purity material would also be generated; ii) residual inventories of ODS (typically CFC-11, and CFC-12) that remain after phase out or conversions to non-ODS technology; iii) stocks that may exist in closed or bankrupt enterprises; and iv) material confiscated by customs authorities. Colombian regulations require registration and monitoring of all such stocks under the authority of UTO within MADS. A summary of UTO's current inventory records of monitored EOL ODS (including some projected to be generated in 2012-13) is provided in Appendix 3. Of specific interest to this project as it will provide the test burn material used for demonstrating national destruction facilities is the current inventory of 5.7 t of CFC-12, and 4.1 t of CFC-11, along with an additional 4 t of CFC-11 that will be generated in 2012-2013 from a MLF financed chiller demonstrative replacement project currently under implementation.

However, the main rationale for the country to address the issue of EOL ODS is recognition that there remains substantial banks of ODS within operational equipment and products in the country, including priority banks of CFCs which would likely be released in the absence of a targeted effort to capture and destroy them. Additional incentives to address such banks and particularly those contained in refrigeration and air conditioning equipment arises because of the potential energy efficiency gains obtained by its accelerated replacement and by the avoided climate impacts obtained by both energy efficiency improvement and eliminating release of CFC-12 in particular due to its high GWP.

Interest in ODS Banks dates back to 2003-2004 when UTO coordinated a research project with the support of the domestic refrigerators manufacturers that are part of the National Businessmen Association of Colombia (Asociación Nacional de Empresarios de Colombia - ANDI), the National University of Colombia and University of Los Andes, with the objective of gathering the information on banks of CFC-based domestic refrigerators and the possibility of developing reverse manufacturing capability in the country. This was followed by research in 2004 on national capacities for ODS destruction done by the Ministry of Environment, and the National University. Two years later, the Energy and Mining Planning Office (UPME) of the Ministry of Mining and Energy hired a consultancy on energy consumption of air conditioners and domestic refrigerators in 4 Colombian cities. The latter led the identification of domestic refrigerator replacement as a core program of the national strategy of rational energy use (see below).

The physical processing of domestic refrigerators was piloted in 2008 in a four month project undertaken in Bogota and involving the replacement of a variety of operating CFC based domestic refrigerators of a variety of sizes, the manual extraction of refrigerant and foam, recycling of other material, and destruction of captured CFC-12 and CFC-11 containing foam. Participants included domestic refrigerator manufacturers and retailers, and waste management companies developing recycling and specialized capability, as well as MADS and UNDP. The

destruction of the CFC-12 was contracted for export destruction and the bagged foam was destroyed in a domestic commercial solid industrial waste incineration facility. The former has not yet been completed due to high cost and administrative barriers. The destruction of the foam, while successful operationally, did not involve any evaluation of destruction efficiency or emissions as a basis for qualification against international standards and specifically the applicable TEAP guidelines. Overall, this pilot project determined various parameters for use in the development of a large scale program, particularly things like representative CFC-12 and CFC-11 content, capture rates and indicative unit cost, as well as establishing the initial feasibility of using domestic incineration facilities at least for foam destruction and getting a better understanding of issues associated with export. A final substantial benefit is the interest created in developing this kind of business both among the producers and retailers of refrigeration equipment and among national waste management service providers, an number of whom are pursuing investment plans to establish commercial scale capacity as part of national waste diversion and materials recovery program implementation related to WEEE and hazardous waste streams under the framework policies described below.

On the basis of this initial work, the country has moved rapidly over the last several years on three related and coordinated policy initiatives now being implemented and which will result in generation of substantial amounts of EOL ODS requiring destruction.

- *Program for on the Rational and Efficient Use of Energy and Non-conventional Energy Sources*: The Ministry of Mining and Energy and its subsidiary bodies have been configuring the national framework program on energy efficiency and alternative energy sources. This has now been formulated into the 2010-2015 Indicative Action Plan of the Programme on the Rational and Efficient Use of Energy and Non-conventional Energy Sources that has been adopted as government policy in Resolution No. 180919 of June, 1st 2010. Within this framework, the substitution of domestic refrigerators has been identified as a priority activity given that initial studies have shown in a 20-year scenario analysis the savings on consumption would be of about 198 GWH per year. One specific project initiated within this framework is an Energy Efficiency Project in Buildings being undertaken with GEF funding and supported by the UNDP, a portion of which includes air conditioning and chiller conversions. Most recently (2011), a more detailed study was undertaken on steps for its implementation and specifically it's financing and is now serving as the basis for development of financial incentives that will support the replacement of old refrigeration equipment, particularly domestic refrigerators. The estimates of avoided GHG emissions emission over a ten year period through such program is 420,000 t CO_2 Eq. The schedule for implementation of an energy efficiency related financial incentive for refrigerator replacement is anticipated to be implemented in early 2013.

- *Environmental Policy for Integrated Hazardous Waste Management:* The Environmental Policy for the Integral Management of Hazardous Wastes was adopted in 2005. It sets out long term strategies based on the principles of integrated product life cycle management with the general objective is to prevent the generation of hazardous wastes and to promote the environmentally sound management of those being generated, with the purpose of minimizing the risks on human health and on the environment, thus contributing to sustainable development. The specific objectives of this Policy are: i) Preventing and

minimizing the generation of hazardous wastes; ii) Promoting the environmentally-safe management and handling of hazardous wastes; and iii) Implementing the commitments of the International Conventions ratified by the country, related with hazardous substances and wastes. This third objective refers to the harmonization, cooperation and application of strategies and actions towards complying with the implementation of the National Application Plan of the Stockholm Convention and the Phase Out Plan for Ozone Depleting Substances – ODS and their wastes according to the Montreal Protocol. In the Action Plan of the Policy, a goal for the period 2006-2018 has been established that would to achieve 40% elimination of hazardous wastes that are a priority under the international commitments (including ODS) with a current year goal having a program for the management and final disposal of ODS wastes. One concrete result of this policy generally has been the recent development of modern rotary kiln high temperature incineration facilities in the last several years, something that now provides a domestic option for destruction of EOL ODS chemicals, subject to their qualification to international standards.

- *National Policy on Waste Electrical and Electronic Equipment (WEEE)*: Division of Sectorial and Urban Environmental Affairs in MADS has been developing a policy and Action Plan on WEEE management since 2006. Previous work includes pilot studies such as described above for domestic refrigerators, as well as expanding programs on collection of cellular telephones, computers and other electronic equipment. The centre piece program under this policy is the early retirement of older domestic/commercial refrigeration and air conditioning equipment with a specific focus on domestic refrigerators that used CFC-11 and 12. The program will be funded at least in part by a national Extended Producer Responsibility (EPR) mechanism covering subsidized replacement with higher efficiency/non-ODS replacement equipment as well as the costs of collection, processing, and environmentally sound waste management of the resulting materials including destruction of refrigerant and foam. This policy has been formally approved by the government and the legislative basis for its implementation is currently before the national parliament. In parallel, the necessary regulatory and administrative measures for its implementation are under development. The schedule for the start up of the program is early 2013 with its full operation by 2015.

The above developments has resulted in the adoption of a national target of replacing 2.6 million CFC based domestic refrigerators over a ten year period beginning in 2013. Based on the data obtained in the 2008 pilot project this quantity of equipment is estimated to contain approximately 1,165 t of CFCs (420 t of CFC-12, 745 t of CFC-11)[7]. It is assumed that 300,000 units would be processed during a two year start up period (2013-2015) which would contain 134 t of CFC-11 and CFC -12. For purposes of estimating ODS destruction capacity the requirements based on conservative recovery efficiencies for manually extracted CFC-12 and CFC-11 containing foam[8] would result in a 10 years requirement to destroy 294 t of CFC-12, 10,640 t of CFC-11 containing foam (resulting in destruction of 560 t of CFC-11). For purposes of this project that would just cover the first two years, the material that could be destroyed

[7] Estimate based on data collected during 2008 trial processing with a representative unit containing 0.161 kg CFC-12, 4.092 kg of foam and at 7% retained blowing agent content, 0.286 kg CFC-11

[8] Calculations based on a 70% recovery rate for CFC-12 using convention servicing equipment and a 75% recovery rate for CFC-11 using manual dismantling and foam removal. Recovery rates approaching 95% are achievable with more sophisticated extraction technology which might ultimately be justified.

would be 34 t of CFC-12, and 1,228 t of CFC-11 containing foam (effective destruction of 65 t of CFC-11).

Other preparatory work relating to the proposed project involved assessing the various options in terms of processing and EOL destruction technologies that might be available to support the national requirements as anticipated under the above initiatives. The following summarizes the results of this work as inputs to the project design and scope:

- *Options for Refrigerator Disassembly and EOL ODS Recovery:* Two generic options for refrigerator disassembly have been identified and assessed, manual dismantling and automated reverse manufacturing facilities.

  a) *Manual dismantling:* This would involve the following main steps: i) extraction of refrigerant into ODS containers and compressor oil; ii) removal of the compressor, refrigeration piping for metals recovery; iii) separation of plastic door and cabinet liners; and iv) separation of PU foam from the metal door and cabinet panels with PU foam placed in bags. This process can be organized with various levels of sophistication in terms of an assembly line type operation to increase throughput and efficiency. It can also be tailored in terms of scale depending on the location and quantity available within an economic distance. As such, the country could be served by a number of such operations that might handle from a few thousand units per year in remote areas to up to 50,000 units per year in urban areas with the latter likely justifying more sophisticate CFC-12 extraction technology that would achieve >95% recovery efficiency rather than the basic refrigeration servicing equipment used in such operations. A number of interested contractors currently established in the waste management and scrap recycling business have expressed interest in such operations, often as physical extensions of their present operations that provide basic infrastructure and labor capacity. The process is labor intensive but can utilize relatively unskilled workers except for a requirement for qualified technicians handling refrigerant extraction. In environmental terms, the main limitation is the lower CFC-12 recovery efficiencies achieved in rapid excavation with conventional equipment, and loss of foam blowing agent that will occur during its manual removal. It is generally assumed that this would be approximately 25% of the originally retained volume. The initial capital investment entry barrier is low and suited to incremental development as the demand grows with developing programs. Based on initial experience from potential contractors undertaking this work for warranty and specialized product stewardship programs in Colombia, typical unit costs for manual disassembly and capture of refrigerant in cylinders and bagged foam is estimated to be US$3.5 to 4.0 per unit. Somewhat lower costs would be anticipated for larger operations.

  b) *Reverse Manufacturing Facility:* The second option examined was development of a reverse manufacturing facility specifically designed for refrigerators. These are commercially operated in some Western European countries, on a limited basis in North America, and are under development in several larger developing countries. Two such facilities have been commissioned in Brazil using bilateral capital funding but are not yet in commercial operation. As in manual dismantling these facilities manually extract refrigerant and compressor oils although in a production line setting and with

extraction/condensing equipment that facilitates rapid degassing of the complete refrigeration circuit. They then shred the remaining intact unit in a sealed environment and separate the metals, plastic, and PU foam solid fractions in a form available for sale into the recycled materials market. The emitted foam blowing agent is captured and condensed for containment and subsequent destruction with in excess of 95% capture efficiency. Some suppliers include destruction using a thermal process as an option that can be added to the facility. Estimating quotations applicable to Columbia for units of 300,000 and 400,000units/year require base equipment investment of US$4.4 and 4.9 million respectively exclusive of land, services, buildings, foundations and overall site infrastructure. An overall cost of US$21/unit would be applicable to such facilities operating at full capacity, excluding any revenues obtained from recovered material sales. Estimates at comparable facilities developed in Brazil – provided by these operators - were in the range of US$14/unit as a comparison.

The overall conclusion of this work was that, while ultimately Colombia may be able to sustain an automated reverse manufacturing facility this would not be justified at least during the start up of the refrigerator replacement program envisioned. It is recognized that there will be a start up period for the program where volumes of refrigerators collected will increase step by step, reaching a steady state level of 250,000-300,000 units per year over a two to three year period. However to make the level of investment required for economically scaled reverse manufacturing facilities, enterprises would have to have some assurance that these levels will be achieved and when. In that regard, the project has been following up the advances occurring in Brazil in this regard. In summary, the analysis undertaken suggests that it is advisable to take an incremental approach to investment in refrigeration equipment processing technology starting with manual operations scaled to local and region generation rates, while looking forward to capitalizing on the economies and higher environmental benefit efficiencies of more sophisticated CFC-12 extraction equipment first, and then if warranted modern automated reverse manufacturing technology. .

- *Options for EOL ODS destruction:* The various strategic and technology options for destruction of EOL ODS including CFC-11 containing foam have been reviewed as a basis for developing the project design and its detailed scope. In general, the menu of available technological options that would meet the destruction performance requirements set out by the Montreal Protocol is well known. These have been reviewed in the previous referenced TEAP documentation adopted by the Parties, including the most recent update in 2010 where a number of new innovative but as yet fully commercialized technologies were considered. Similarly, both the Basel Convention[9] and the GEF Scientific and Technical Assessment Panel (STAP)[10] have issued guidance documents on the selection of destruction technology for POPs which also provide relevant information given the similarities in requirements for environmentally sound destruction of chlorinated chemical wastes, including both so-called combustion and non-combustion technologies. Overall the strategic options considered for this project were: i) export to qualified facilities in countries party to the Basel Convention; ii) the development of new national facilities using imported technologies; and iii) utilization

[9] http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tg-POPs.pdf
[10] http://www.unep.org/stap/Portals/61/pubs/POPs_Disposal_Final_low.pdf

of existing national hazardous and industrial waste management capacity that could potentially be qualified to international standards. Each of these is discussed below.

a) *Export to qualified hazardous waste management facilities:* This option would essentially be applicable to the actual chemicals under the assumption that the cost of bulk export of any significant quantities of CFC-11 containing foam would be prohibitive. The export options considered available to Colombia are North America and Europe, noting that the United States status as a non-party to the Basel convention limits consideration of that destination directly. Facilities qualified and experienced in destroying EOL ODS exist in Mexico, the United States and Canada. These primarily employ high temperature incineration (HTI) although commercial plasma arc facilities employing PLASCON technology operate in Mexico and the United States. In Europe, to date HTI is the main available commercial option with a number of facilities existing that have destroyed EOL ODS. As part of the preparation work for this project, Colombia has initiated export of a small trial quantity of CFC-12 from the 2008 refrigerator processing trial to Finland for incineration. In general, facility gate market prices for EOL ODS destruction with HTI in North America range from approximately US$1.5/kg to US$3.0/kg and essentially mirror the market pricing for non-flammable halogenated waste. Destruction with plasma arc technology is reported to be somewhat higher. The European market is generally more expensive with gate destruction costs ranging from US$4-5/kg, although recent trends have shown that pricing in the general hazardous waste market in Europe to be dropping. Current pricing for POPs shipped from Eastern Europe is in the range of US$1.5-2.0/kg. It should be noted that all of these costs exclude Basel Convention transaction, local administration/supervision, local handling and sea container transportation. Based on quotations from the UNDP demonstration project in Ghana (overall destruction cost of US$12.3/kg) , reasonable estimates of these would be US$6/kg including US$3/kg for transportation and US$1/kg transaction costs for Basel documentation into the EU. Colombian experience for export of CFC-12 from its pilot program was US$11-12/k inclusive of transportation and transaction costs.

b) *Development of new national facilities using imported technologies:* The option of developing specialized facilities for destruction of EOL ODS has been evaluated, as well as consideration of possible utilization of such facilities for POPs as well. The two technologies evaluated were the Asada Plasma X unit and a PLASCON unit. The Asada unit with a capital cost of US$156,000 (excluding supporting infrastructure and permitting costs) and estimated annual operating cost of approximately US$30,000/year to destroy under 3 t of CFC-12/year was considered both prohibitively expensive (Estimated as US$22.8-25.9/kg) and inadequate in terms of capacity for Colombia's requirements. The PLASCON unit evaluated had a capacity of approximately 200 t/year (80 kg/hr feed rate) and was quoted with a basic capital cost of US$2.1 million excluding transportation from Australia, supporting infrastructure and permitting costs, An overall unit cost range of US$10.3-18.5/kg is estimated for this technology, noting that a cost of US$6.5/kg in Australia would apply at an operating commercial facility there. The assessment concluded that development of this technology in Colombia exclusively for EOL ODS destruction would not be viable as it was relatively high cost and oversized for the national requirement. However, it could be a fall back option under certain

conditions, namely it could also serve to destroy POPs and other priority high risk chemical wastes, and if less expensive qualified options were not available, specifically export and use of existing domestic facilities if qualified.

c) *Utilization of existing national hazardous and industrial waste management capacity:* This option involved re-examining the potential for existing domestic incineration facilities to be qualified to international standards, specifically those that could potentially be qualified to international standards as referenced above. This involved review of the present permitting and qualification protocols and standards in force in Colombia as applied to hazardous waste thermal treatment/incineration facilities as well as identify these facilities subject to this legislation and permitting process. The specific regulatory requirements in force under the Ministry of Environment and Sustainable Development that apply are as follows:

i) DECRETO NUMERO 4741(30 DIC 2005), "*Por el cual se reglamenta parcialmente la prevención y el manejo de los residuos o desechos peligrosos generados en el marco de la gestión integral*": This is the national hazardous waste regulatory act and provide for the environmental sound management of hazardous waste. In general it is a comprehensive document fully aligned and comparable to similar legislation in OECD countries.

ii) RESOLUCIÓN NÚMERO (909), *"Por la cual se establecen las normas y estándares de emisión admisibles de contaminantes a la atmósfera por fuentes fijas y se dictan otras disposiciones", 5 de junio de 2008:* This is the principle regulatory document covering air emissions for fixed sources and generally applies emission standards generally equivalent to US Clean Air Act standards. Chapter VII provides for an environmental license and environmental management plan. Chapter XII applies specifically to emissions from hazardous waste disposal in thermal treatment facilities, specifically incineration and cement kilns. It requires a supervised test burn on each hazardous was aggregate processed as a condition of permitting and inclusion of an operating continuous monitoring and recording system. Minimum operating conditions and air emission limits are also specified for both hazardous waste incinerators and cement kilns. These are summarized in Appendix 3. These generally meet or exceed those applied in North American and EU standards as well as the Basel, GEF STAP and TEAP destruction guidance standards. Of particular relevance is the universal adoption of the 0.1 ng ITEQ/Nm^3 requirement in 2012. This exceeds the current TEAP limit of 0.2 ng ITEQ/Nm^3 and is the same as that generally adopted in the other standards and guidance referenced.

iii) "PROTOCOLO PARA EL CONTROL Y VIGILANCIA DE LA CONTAMINACIÓN ATMOSFÉRICA GENERADA POR FUENTES FIJAS (Protocol for Control and Surveillance against the Atmospheric Contamination Generated by Stationary Sources)", Versión 2.0, OCTUBRE DE 2010 – This document sets out the monitoring and reporting requirements for stationary source air emissions and in Chapter 8, specifically sets out the procedural requirements applicable to the test burns required of hazardous waste

incineration/thermal treatment facilities specified in RESOLUCIÓN NÚMERO (909) above. This effectively provides the national baseline requirement for developing test burn specifications that would qualify facilities for EOL ODS destruction. It also defines the basic destruction performance requirement in the form of target destruction removal efficiency (DRE). This is set at 99.99%, a level lower that typically applied to chlorinated hazardous waste in OECD countries and the Basel and GEF STAP guidance documents (typically 99.9999%) but is consistent with the requirement in the TEAP guidance adopted by the Montreal Protocol.

In terms of available facilities in Colombia for the destruction of hazardous and industrial waste, there are 45 installations that are permitted or being permitted. This includes incineration facilities and cement kilns involved or considering waste co-disposal. The incineration facilities range from medical waste incinerators of various sizes, basic fixed hearth and vertical chamber industrial incineration facilities through to several modern rotary kiln incinerators recently commissioned to respond to the growing demand created by the increasingly strict national regulation of hazardous waste as well as the country's rapid industrialization. Screening of these facilities and their permitting status suggested that four facilities would potentially be capable of consideration for EOL ODS, two of which are operated by the same national hazardous waste management company. These are:

i) TECNIAMSA S.A – Barranquilla: This facility was commissioned in 2010 as part of an integrated hazardous waste management facility including a modern engineered hazardous waste landfill. It is located in a rural setting approximately 20 km from the port city of Barranquilla on the Caribbean coast. Overall the incineration facility contains all the current technology including a rotary kiln primary combustion chamber, high temperature secondary combustion chamber stack quenching unit and sequence semi-dry wet scrubbers and bag house filters, as well as continuous air emission monitoring and a modern automated control system. The rated capacity is 1,000 kg/hour but is planned to be able to double capacity by addition of a second rotary kiln. The facility currently handles liquid and solid waste with a dual feed system. It could be readily modified with an additional injection port for gaseous waste stream such as CFC-12 at released from pressurized cylinders. The facility is currently restricted in waste chlorine content but intends to extend its test burn qualification menu to include halogenated wastes with a potential interest in destruction of POPs (specifically PCBs). Test burn and regular testing done twice per year on current waste streams indicates very low PCDD/F emission levels (0.0005 ng- ITEQ/Nm^3) suggesting that it would have good potential to handle higher chlorine content waste.

ii) TECNIAMSA S.A – Bogota: This facility, located in an industrial area outside of Bogota, was commissioned in late 2011 is essentially the same technically as the facility described above in Barranquilla including capacity and licensing conditions, including classes of halogenated chemical wastes although not

including ODS. Given the recent commissioning of the facility full test burn qualifications are not yet completed, including for PCCD/F emissions. However, a reasonable expectation would be that it would have comparable performance to the Barranquilla facility.

iii) Protección Servicios Ambientales Rellenos de Colombia S.A. ESP - PROSARC S.A. ESP: This is a rotary kiln incineration facility located in Mosquera, Cundinamarca municipality which has been used to dispose of PU foam extracted from the pilot refrigerator replacement and processing project. The facility was established in 2006 for the handling and treatment of organic and inorganic hazardous waste. It has a single rotary kiln commissioned in 2010 with a capacity of 500 kg/hour equipped with a secondary combustion chamber and basic air pollution control system. It handles a wide range of waste ranging from medical waste to various industrial and consumer waste streams. It has limited experience with halogenated wastes. The most recent test burn results indicated PCCD/F emissions of 0.48 ng/m3 which exceed limits to be in force in mid 2012 and which would qualify the facility for EOL ODS destruction. However, the facility indicates that this will be improved.

iv) HOLCIM Colombia S.A.(Eco Procesamiento Ltda): Holcim Colombia S.A operates a large modern cement kiln located at Nobsa. The facility reflects current dry process technology and air pollution control facilities, and is generally viewed as the best facility in the country. Through a subsidiary involved in acquiring waste (Eco Procesamiento Ltda), they have been working with MADS on processing various wastes for a number of years, and have attempted to destroy various hazardous waste streams including PCBs and POPs pesticides. While technically this was likely feasible, they have dropped that direction due to public resistance. Subsequently they had expressed interest in processing EOL ODS, specifically PU foam wastes. However, the main limitation in relation to this is the inefficiency of handling and injecting a relatively small quantity of bulky low mass material into a facility of this scale. Consideration was also given to disposing of CFC-12 which likewise would likely be technically feasible but the capital investment to install the necessary injection ports and burners could only be justified on the small volumes involved if there was a viable carbon crediting or offset mechanism they could utilize corporately within the company's global system. This continues to be investigated but would not be available as an option to the current project.

Therefore, Colombia has a well established mature legal and regulatory system for the management of hazardous waste. The requirements and procedures in place and enforced by institutions and technical capability are generally aligned with those in developed countries. Similarly, the country has a rapidly developing and capable waste management service provider base that is investing in modern capability, both in the collection and handling of hazardous waste and in its environmental sound processing, treatment and disposal. In particular, it now has several thermal treatment and destruction facilities that should be capable of undertaking the destruction of EOL ODS. Subject to demonstration of this capability in accordance with

international standards, utilization of domestic destruction capability should be more cost effective than alternatives of export to qualified facilities elsewhere, or developing new purpose built facilities with alternative technologies.

In summary, Colombia is moving rapidly to implement the policy, regulatory and financial mechanisms that will to capture a substantial quantity of CFC based equipment subject to early replacement. It has piloted their processing up to the capture of the EOL ODS in the form of extracted CFC-12 and manually removed foam. Substantial interest exists among private sector waste management contractors already undertaking this kind of work as part of warranty and commercial refrigeration equipment replacements undertaken directly by equipment manufacturers and beverage producers. Subject to evolving global experience, and the program reaching the necessary economies of scale, it is anticipated that in the longer term one or more of these firms will incrementally invest in higher efficiency and potentially automated reverse manufacturing technology to maximize recovery of EOL ODS.

At present, the remaining gap in the operational capability needed to support the program is the identification of a cost effective and environmentally sound means to destroy the substantial quantities of EOL ODS, particularly high global impact CFCs. In fact, this represents a major current barrier to implementation of the refrigeration replacement programs that now have policy commitment and are developing the necessary financing mechanisms. The proposed project described below is designed to fill this gap.

3. PROJECT OBJECTIVES AND DESIGN

The overall project objective is to put in place a sustainable, environmentally sound and affordable capability for Colombia to destroy the "end of life" ODS that it is accumulating and which will rapidly increase with current policy energy efficiency and waste management initiatives involving the replacement of CFC based domestic refrigerators. Other objectives are to: i) integrate the management of EOL ODS into the countries overall hazardous waste management system; ii) to enhance synergies with initiatives related to meeting national obligations under the Stockholm Convention respecting the destruction of POPs stockpiles; iii) contribute to the technical knowledge base on destruction and environmental performance of technologies accessible to developing countries; and iv) demonstrate how a developing country can develop national capability to manage EOL ODS for broader replication as appropriate.

The proposed project design is based on the use of MLF funding to support the qualification of three domestic incineration facilities for the destruction of EOL CFC-12, CFC-11 and CFC-11 containing PU foam.

The strategic selection of existing domestic incineration facilities as the basis for the project is based on the extensive project preparation investigations of various options described above. While both export and development of purpose-built facilities, specifically those employing plasma arc technology, constitute options that are technically viable options, both are assessed as involving significantly higher unit costs for destruction than should be achievable by employing qualified domestic hazardous incineration facilities. Export to Europe or North America would be in the range of US$10-12/kg. Plasma arc facilities installed in Colombia are estimated to involve costs in the range of US$18-25/kg with scale limitations in relation to national requirements. However, it was concluded that the PLASCON technology package could be an option in the longer term in the context of its possible integration with a reverse manufacturing facility but also for use with other difficult to destroy liquid and gaseous hazardous waste. For this reason, some technical assistance funding is proposed to pursue more detailed evaluation of this option in support of the incremental development process.

In strategic terms, the election to demonstrate domestic options is also based in part on a policy position to avoid waste exports if possible given the country's policy of banning imports. The development of environmentally sound waste destruction capability is also generally consistent with the country's industrial infrastructure strategy and most immediately supports national management of persistent organic pollutants (POPs). The latter would be foster by ensuring the close integration of this project with the current GEF PCB management project being coordinated within a common institutional structure and potentially utilizing the knowledge base developed in the qualification of domestic destruction facilities to further achieving the objectives of both the Montreal Protocol and the Stockholm Convention.

The rationale behind qualifying destruction capability for both for CFC-11 containing foam and recovered CFC-11 in liquid form is so that two options are covered given the overall incremental approach adopted for developing domestic EOL ODS destruction capability. Recognizing the capital investment and cost barriers as well as risks in going directly to sophisticated reverse manufacturing capacity elsewhere, it is prudent to start off with a manual process that can be

incrementally scaled up as supply develops, notwithstanding the penalties in ODS recovery efficiency. The latter will be partially offset by provision in the project for introduction of more sophisticated high efficiency CFC-12 refrigerant recovery equipment employing de-gassing capability as refrigerator processing volumes increase. The pre-qualification of CFC-11 liquids serves to remove a possible barrier to the eventual investment in such high efficiency capability when economies of scale and financing mechanisms (particularly carbon finance) are in place. This incremental project design strategy should serve as useful and practical demonstration for broader replication elsewhere.

The qualification of the existing domestic incineration facilities will be accomplished through undertaking comprehensive test burns on not less than 5 t of each of these waste streams at least one facility. The required CFC-12 and CFC-11 as summarized in Tables 1 and 2 below currently exists and is under the regulatory control of the UTO. MLF funding will not cover the collection of this material, but rather only the centralized consolidation, storage, characterization and transport. Likewise, the CFC-11 containing foam used will have already been collected at metal scrap enterprises processing scrapped domestic refrigerators and MLF funding will support its extraction, storage, characterization and transport for destruction through arrangements with these enterprises. . In its second phase based on the qualification results, the project will then cover the destruction of CFC-12 and CFC-11 containing foam to be manually recovered from the initial 300,000 domestic refrigerators generated by the appliance replacement program. This will involve the destruction of an estimated 34 t of CFC-12, and 1,228 t of CFC-11 containing foam (effective destruction of 65 t of CFC-11). The project will also support the incremental development of key institutional and technical capacity through technical assistance related to regulatory measures, the practical implementation of the EPR and energy efficiency based financing mechanisms and potential future technology selection that could be introduced to optimize EOL ODS destruction efficiency when the refrigerator replacement program offers appropriate economies of scale. Provision is also made for development of a summary technical report reflecting the project's results, comparative analysis with other global experience and recommendations for use by ExCom and the Parties in advancing and replicating this experience.

As elaborated in more detail in Section 5 below, the project complies with the criteria established by Decision 58/19 and involves aspects that are not necessarily addressed by other pilot projects approved by ExCom. As such it should be of significant value in the broader context of demonstrating practical aspects of implementing a sustainable EOL ODS destruction program in comparable in Article 5 countries generally. More specifically the project includes the following features that should be of broader demonstration value:

- Provides an example of the ability of a country to manage its own EOL ODS issues on a cost effective basis without relying on export
- Develops an incremental approach to developing EOL capture and destruction capacity by utilizing and qualifying facilities and service providers in a manner that recognizes the need for intermediate steps involving manual processes and lower efficiency destruction capability for foam before implementation of highly sophisticated technologies for reverse manufacturing and destruction capability will be affordable or sustainable.
- Demonstrates the integration of EOL ODS management into a broader WEEE management program in a industrializing middle income Article 5 country such that it is

mainstreamed with both current global and developed country policy approaches to life cycle waste management generally and energy efficiency/carbon foot print reduction.

- Fosters synergies with Stockholm Convention by undertaking its implementation in close coordination with a current GEF Chemicals Focal area project managing national PCB waste stockpiles and contaminated sites such that common standard and methodologies for globally significant chemical wastes destruction are demonstrated and established, with associated economies of scale and a common service provider base.
- Inform current discussions within the TEAP ODS Destruction Task Force as reflected in the most recent TEAP ODS Destruction Task Force report referenced above regarding the equivalency of these two parameters used in assessing environmental performance of organic waste destruction facilities generally.
- Directly captures and destroys all currently available EOL ODS stocks including those directly resulting from other MLF funded ODS phase out projects which incorporated mandatory care and custody provisions for ODS that was being phase out (i.e. in refrigeration servicing, MDI and chiller projects).

The tables 1 and 2 show the summary of available and/or potential available EOL CFCs for destruction. Detailed information about sources can be found in the Appendices 3.

Table 1: Summary of Available and Potentially Available End of Life CFC-12 for Destruction Demonstration (kg)

CFC-12 and CFC-12 mixtures Totals	**5,674**
Available immediately	5,674

Table 2: Summary of Available and Potentially Available End of Life CFC-11 for Destruction Demonstration (kg)

CFC-11 Totals	**8,120**
Immediately Available	1,823
Availability being confirmed	2,297
Availability – end of 2012	900
Availability –end of 2013	3,100

4. PROJECT DESCRIPTION

The proposed project described below has been structured into three components. Component 1 (ODS Destruction Demonstration), Component 2 (Technical Assistance) and Component 3 (Project Management, Monitoring and Evaluation). Within each, a number of sub-components and discrete activities have been defined. These are summarized to the sub-component level with proposed financing and timing in Table 3 below. A more detailed and elaborated project framework matrix listing activities is provided in Appendix 5 and detailed schedule in Appendix 6. The following provides a detailed project description by Component, Sub-Component and Activity.

Component 1 – ODS Destruction Demonstration: This is the project's main component and covers the actual destruction demonstration work. The proposed activities are staged. The first stage (Sub-components 1.1 and 1.2) involve the assembly/consolidation/characterization of EOL ODS for the test burns, inclusive of current stocks of CFC-11 and CFC-12 (Tables 1 and 2 above), as well as extraction of sufficient CFC-containing foam from previously collected refrigerator carcasses at two or potentially three larger metal scrap yards. This would occur over a nine month period starting in mid 2012. The second stage (Sub-components 1.3 and 1.4) is the actual monitored test burns involving pre characterized packages of at least 5 t of material at up to three domestic rotary kiln hazardous waste facilities. This would be undertaken throughout 2013 with preparatory work in late 2012. The third stage Sub-Component 1.5) is the use of those facilities qualified to destroy the CFC-12 (estimated 34 t) and CFC-11 containing foam (estimated 1,228 t) derived from the first 300,000 refrigerators recovered in the start up phase of the national replacement program. The timing for this would be throughout 2014 and early 2015 as required. A more detailed description of each sub-component follows:

- *1.1 Consolidation/storage/characterization/transport of CFC-11 and CFC-12 EOL ODS:* As indicated in Tables 1 and 2 above the inventories of CFC-11 and 12 while secured under UTO regulatory control are widely distributed, of variable purity in some cases, and in relatively small containers for the most part. The activities in this sub-component cover the collection to centralized storage sites (not MLF funded), consolidating the material into larger containers (sizing anticipated to be at least 50 kg containers selected for compatibility with onward transport and incineration feed infrastructure), its characterization as to CFC content and contaminants, secure storage, and ultimately transportation to the test burn sites. It is envisioned that four centralized sites based on current recycling and reclaim operations will be involved. The locations tentatively selected are Bogotá, Medellín, Cali and Barranquilla which offer good national geographical and demographic coverage, and would likely be the locations where larger refrigeration dismantling capacity will develop. The initial collection stage up to the consolidation and storage sites will not be MLF funded but paid for by the current holders. In most cases this obligation is provided for as a condition of earlier CFC phase out project agreements requiring beneficiaries to be responsible for CFC stores. MLF grant funding is proposed for four sets of conventional refrigerant recover equipment (inclusive of tools, accessories and portable analyzers) and a quantity of larger multiple use cylinders and CFC-11 liquid containers with appropriate vapour locks and purging capability. The number will be determined based on compositions and suitability for transport and use at the incineration

Table3: Summary Project Framework and Cost Estimate

Component/Sub-Component/Activity	ODS (kg)	Cost Estimate (US$)			2012		2013				2014				2015	
		MLF	Other	Total	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Component 1: ODS Destruction Demonstration		**830,000**	**1,235,000**	**2,065,000**												
1.1 Consolidation/storage/characterization/transport of CFC-11 and CFC-12 EOL ODS		100,000	50,000	150,000												
1.2 Consolidation/storage/characterization/transport of CFC-11 containing Foam for test burn demonstrations		100,000	-	100,000												
1.3 Test Burn demonstrations for CFC-11 and CFC-12 at a selected HW Incinerators	13,767	250,000	165,000	415,000												
1.4 Test Burn demonstration for CFC-11 containing foam at two selected Industrial/HW Incineration Facilities	1,249	135,000	80,000	215,000												
1.5 Destruction of EPR program start up volumes of CFC-12 and CFC-11 containing foams (Based on 300,000 units, 34 t CFC-12, 65 t CFC-11 in 1,228 t of foam)	99,000	245,000	940,000	1,185,000												
Component 2.0 Technical Assistance		**255,000**	**150,000**	**405,000**												
2.1 Legal and regulatory institutional TA		50,000	25,000	75,000												
2.2 Technical/business planning support for EOL ODS Management under the EPR system		75,000	100,000	175,000												
2.3 Public Consultation and Information		50,000	25,000	75,000												
2.4 Technical Oversight and Overall Project Technical Report		80,000	-	80,000												
Component 3.0 Project Management/Monitoring/Evaluation		**110,000**	**170,000**	**280,000**												
3.1 National Project Coordinator		60,000	60,000	120,000												
3.2 Project office administration		-	60,000	60,000												
3.3 Misc. contract services and travel		20,000	20,000	40,000												
3.4 M&E costs		30,000	30,000	60,000												
Totals	**114.016**	**1,195,000**	**1,555,000**	**2,750,000**												

facilities. Finally, a specific activity is identified to document and report on the origin, tracking, and verification of all the EOL ODS in accordance with procedures suitable for use under an international carbon crediting system if that were to apply. These activities would start in Q2 2012 and be completed by Q1 2013,

- *1.2 Consolidation/storage/characterization/transport of CFC-11 containing Foam for test burn demonstrations:* At present no CFC-11 containing foam is available for a test burn but substantial amounts are included in white goods metal scrap being continuously processed for use in each of Colombia's electric arc steel plants. Operators of these plants and several larger scrap yards feeding these have agreed to include a contracted segregation operation of incoming material (prior to shredding) that would allow accumulation of enough material for the test burn. This would be a simple manual process of removing block PU foam from refrigeration equipment carcasses. Hand held screening detection equipment will be used to separate CFC-11 and HCFC-141b based PU foam and both will be bagged for storage. A target accumulation of at least 10 and preferably 15 t of bagged foam will be accumulated. This process will be contracted competitively, likely to one of the national waste management service providers with current experience manually dismantling refrigeration equipment working in cooperation with the scrap processing enterprises. MLF funding including transportation to the test burn incinerators and analytical costs is proposed recognizing the demonstration value of qualifying a destruction option for manually extracted ODS based PU foam as an important step in an incrementally developed EOL ODS capture and destruction system. It is anticipated that this work will be undertaken during a period from Q4 2012 through Q 2 2013

- *1.3 Test Burn demonstrations for CFC-11 and CFC-12 at selected HW Incinerators:* It is proposed to undertake test burns at the two new rotary kiln incineration facilities operated by TECNIAMSA, one for CFC-12 and one for CFC-11. The test burn process will be utilize the national regulatory requirements and protocols described above, supplemented by an international standard, likely as issued by USEPA[11,12]. The initial activity will be technical assessment work undertaken jointly by an MLF funded consultant and the incinerator operator that will include a base line environmental audit of the facilities and current environmental management plan required under national regulations, development of a detailed test burn protocol and specification, and design for any modifications required for the test burn. A key part of this will be determination of an appropriate ODS feed rate and the waste stream to be co-disposed with ODS along with its compositional characterization.

  In terms of facility modifications required, these are anticipated to be relatively minor as provided for in the ExCom Decision XX/7. For CFC-12 it will involve installation of a new feed port in the front end of the kiln and setting up the feeding cylinder system with appropriate metering and automated record tabulation as well as a switching and purging capability for cylinders. For CFC-11, modifications may involve either a dedicated feed system but more likely simply a connection into the existing liquid feed system and burner

[11] http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/chap13.pdf
[12] http://www.epa.gov/osw/hazard/tsd/td/combust/pdfs/burn.pdf

nozzle, although for purposes of the test burn and integrity of input measurement a dedicated feed tank, pump, metering system and flow controls will likely be required.

On each facility/ODS chemical combination, there will be a baseline test burn with the normal waste stream to be co-disposed, and then a test burn with the ODS. In each case, the monitoring protocol will be followed covering operating conditions (i.e. combustion chamber temperatures, estimated resident times, stack outlet temperatures), the standard menu of regulated emissions including PCDD/F as well as mass balance inputs covering all residual release paths (solid, liquid and gaseous), analysis for key contaminants (including PCDD/F) in solid bottom ash, scrubber residuals) and any liquid residual streams. The intention is to determine both Destruction Removal Efficiency (DRE) and Destruction Efficiency (DE). This would serve to inform current discussions within the TEAP ODS Destruction Task Force as reflected in the most recent TEAP ODS Destruction Task Force report referenced above regarding the equivalency of these two parameters used in assessing environmental performance of organic waste destruction facilities generally. DE is generally considered more comprehensive since it covers all releases though DRE which only assesses releases to air is more generally used including in the TEAP guidelines. It is generally felt that gaseous or high vapor pressure CFCs would only be subject to air release but this should be validated. Likewise, analysis for PCDD/F and any recombinant CFC residuals in all release medium would likewise be useful contributions to the technical knowledge base.

The funding of the test burns is generally split between the MLF and the incinerator operators, the latter who will make substantial direct contribution to the actual testing through labor, modifications and lost business during tests (not accounted for in the cost estimates). Provision for independent supervision of the test burn by an expert consultant is provided for. This will include documentation and reporting, including verification protocols related to actual destruction, consistent with model carbon crediting protocols. In terms of timing, the technical development and planning work would be initiated in Q4 2012 with the actual test burns being undertaken sequentially in 2013 recognizing that some flexibility will be required to work around the regular business of the facilities and annual maintenance shut down schedules.

- *1.4 Test Burn demonstration for CFC-11 containing foam:* This sub-component will follow the same scope and proposed funding pattern as the test burns on the CFC chemicals except that the waste would not be co-disposed with other waste streams eliminating the need for a baseline reference test burn and facility modifications would be minimal and handled by the enterprises. Given that bulked bagged foam is being incinerated existing hopper/container feed systems that include weight scales and recording devices will be used. It is proposed to undertake these test burns at two facilities, likely one of the TECNIAMSA facilities and the PROSARC facility, noting that further investigation of the latter's emission performance will be made in advance. It should also be noted that a comparative assessment of impact on performance will also be undertaken on HCFC-141b based foam and a mixture of this and CFC-11 foam if material is available. This would be of practical value in the longer terms as it may be more efficient to simply destroy mixed foam as manually collected during actual operation of the system. It is anticipated that this work would be undertaken in the latter part of 2013.

- *1.5 Destruction of EPR program start up volumes of CFC-12 and CFC-11 containing foams*: This sub-component covers the destruction of CFC-12 (34 t) and CFC-containing foam (1,228 t containing 65 t of CFC-11) obtained from the dismantling of the first 300,000 refrigerators during the startup phase of the national replacement program. This will be done at domestic facilities qualified through the above work. The CFC-12 is assumed to be done at one or perhaps both of the TECNIAMSA facilities and the CFC-11 containing foam at TECNIAMSA and/or PROSARC with the selection being determined competitively. The destruction costs are indicative at this point but based on current market destruction costs for comparable wastes. The MLF funding is limited to a small portion of the destruction costs overall but will cover all the recovered CFC-12 destruction costs. Additionally, provision is made to apply MLF co-financing to the purchase of two high recovery efficiency plant based CFC -12 recovery units having degassing capability. These would be supplied at the point where the manual dismantling operations had reasonable economies of scale (approximately 50,000 refrigeration units per year) and would allow CFC-12 recovery efficiency to be increased to >95% and accommodate the higher production line scale through puts. The final activity in this component would be development of the overall ODS source through to destruction tracking, monitoring, destruction verification and reporting capability for the commercially scaled system. This will be established utilizing experience gained in Sub-component 1.3 and 1.4 above and will be designed and implemented with a view to being suitable for accreditation under an appropriate international carbon crediting mechanism should that financing option be developed at some point. It is anticipated that this sub-component will be undertaken throughout 2014 as material becomes available in commercial lots for destruction.

Component 2.0 Technical Assistance: This component covers technical assistance and related development work associated with evaluation, regulation and implementation of the ODS destruction demonstration project and in ensuring the legal, regulatory, technical and public acceptance tools are in place to sustain capacity so qualified. It has three sub-components as described below:

- *2.1 Legal and regulatory institutional technical assistance:* This sub-component provides limited MLF support, co-financed by MADS for regulatory enabling measures facilitating and regulating the capture and destruction of EOL ODS. This would include: i) legislation/regulation banning release of ODS and requiring its registered storage and environmentally sound destruction; ii) regulatory technical guidance in support of collection, storage, analysis, tracking, certified destruction and reporting requirements applicable to the management of EOL ODS; iii) legislation/regulation of the technical criteria and specifications for the facilities managing EOL ODS; and iv) legislation/regulation for the EPR system. This work would be undertaken early in the project beginning in Q3 2012.

- *2.2 Technical/business planning support for EOL ODS Management under the EPR system:* This sub-component supports technical and business planning capacity strengthening that will be required by both various stakeholder government agencies and the private sector service providers and investors in implementing the EOL ODS aspects of the overall refrigerator replacement and recovery program. This will include: i) training and technical

support related to operational EOL ODS management; ii) technology option assessment in relation to future EOL ODS processing and destruction technology investments including acquisition of reverse manufacturing capability and purpose built destruction capability; and iii) assessing the options available to development a sustainable carbon crediting mechanisms for EOL ODS

- *2.3 Public Consultation and Information:* This sub-component provides resource financed by both the MLF and government to support stakeholder and public consultations/awareness development on the national EOLODS management system development and its implementation. Given that ultimately any program of this type depends on voluntary participation of individual households and small business, this aspect is fundamental to the sustainability of the initiative. The work funded would take the form of production/dissemination of the normal range information products and use of public promotion vehicles including popular media, web based communication and social media. It would also involve support for a range of stakeholder workshops of both a technical and business nature.

- *2.4 Technical Oversight and Overall Project Technical Report:* This sub-component covers an international consultant having expertise in hazardous waste and WEEE management who will provide technical and business advisory services related to the project's overall implementation and specifically in relation to detailed scope definition and peer review of test burn design, and various technical assistance work above including refrigeration equipment processing and technology destruction evaluations, WEEE/EPR system implementation and introduction of carbon finance. It will also cover the preparation of a detailed technical completion report documenting project's results (facility baseline, kiln modifications, test burn procedures, performance against reference standards); life cycle tracking procedures and results; comparative analysis with other global experience and recommendations for use by ExCom and the Parties in advancing and replicating this experience report upon completion. The inclusion of this sub-component was included based on consultation with the MLF Secretariat and recognizes the broader demonstration value.

Component 3.0 Project Management/Monitoring/Evaluation: This component covers the normal project management costs associated with this kind of project which would be primarily funded by MADS. MLF funding would be associated with partial funding of incremental staffing costs in the form of a full time project coordinator, project documentation printing/translation costs and local project related travel. This component also provides for normal M&E costs also on a cost shared basis between the MLF and the government.

5. PROJECT JUSTIFICATION AGAINST FUNDING GUIDELINES

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 by way of direct response to the requirements as set out by the above mentioned Decision 58/19:

5.1. 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

The overall project addresses the complete range of activities associate with ODS disposal. In its entirety provides demonstration across all activity categories and their integration. However, MLF support is limited to only transport, storage and destruction, and then only for purposes of consolidating current stocks of EOL ODS, undertaking their characterization , providing secure storage until demonstration of destruction is undertaken, and then transport for such destruction. The initial collection of demonstration materials is financed by the current holders or is undertaken by tapping into an established commercial collection system as is the case for CFC-11 based foam used for the test burn material of this type. More broadly, the larger scale demonstration obtained in the start up phase of the national EPR based refrigerator replacement program is entirely nationally financed with the exception of modest increment equipment additions to capitalize on economies of scale and optimize EOL ODS capture efficiency, and for payment of a minority portion of actual destruction costs.

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

Colombia is an active participant of all major chemicals multi-lateral agreements and initiatives, a number of which have current and future synergies with the proposed project. At a high level, it actively participates in activities associated with the International Conference on Chemicals Management and work under the SACIM framework promoting sound chemicals management.

Similarly it is a highly involved Party to the Basel Convention and a principle advocate of implementation of the Basel Ban Amendment endorsed at the last Basel COP which was held in Colombia. Linkage to the Basel Convention is significant in the context of this project given the strategic focus it has taken to utilize domestic destruction capability, as opposed to export of its wastes. It is also a strong policy motivator behind the countries broader national hazardous waste management policy and implementation of WEEE and waste derived resource recovery programs into which EOL ODS management is integrated (Section 2 above).

This project has a close linkage to the country's work implementing the Stockholm Convention through its National Implementation Plan. The recently approved GEF-5 PCB management project where arranging environmentally sound disposal of PCB stockpiles and wastes under

Article 5 of the Stockholm Convention has specific synergies respecting this project and enhancement of its demonstration value. As highlighted in Appendix 5, a number of specific activities in the project offer opportunities for complimentary synergy with the GEF project and potential to optimize long term economies associated with implementation of both the Montreal Protocol and Stockholm Convention. These include: i) the development of technical specifications, guidance materials and protocols governing the qualification of destruction facilities for complex halogenated chemicals; ii), facility upgrades and modifications; iii) baseline destruction facility performance testing; iii) consulting and supervision services; iv) regulatory development with a common waste management framework; v) public consultation and information; and vi) general project management support. These will be further developed during the PPG stage of the POPs project which has been approved for funding and is preparing for implementation. The linkage is further strengthened at a practical level by the common line institutional responsibility for implementation in the same division of MADS.

The final chemicals management aspect where such synergies exist are in relation to international initiatives related to climate change and green house gas reduction. The project itself will provide a significant avoidance of GHG release from the destruction of ODS alone (Estimated to be over 750,000 t of CO_2 Eq). The full implementation of the planned 10 years program to replace 2,600,000 domestic refrigerators would result in approximately 2.2 million t CO_2 Eq in GHG avoidance. During the same period, the preparation studies undertaken by the government suggest that implementation of the refrigeration program will result in GHG release reductions of 420,000 t CO_2 Eq. While no decisions on the incorporation of carbon finance mechanisms in the national program has been made, consideration is being given to development of a Kyoto Protocol CDM project and the potential for the use of voluntary carbon markets, both of which could be linked to possible GEF funding. In anticipation of these possibilities, this project has incorporated features to ensure development of appropriate source certification, tracking and destruction verification. These are elaborated generally below in relation to monitoring and verification procedures.

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

The amounts of ODS meant to be handled in the project are described in detail in previous sections and Appendix 3. Currently available end of life (EOL) ODS stocks in Colombia are 15 t, and an anticipated 65 t of CFC-11 and 34 t of CFC-12 recovered over the first two years of implementation of the national refrigerator replacement program undertaken in accordance with WEEE legislation now being enacted. An annual estimated destruction rate of 56 tons of CFC-11 and 29 t of CFC-12 is projected beyond the project life.

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

Currently available end of life (EOL) ODS stocks in Colombia are 15 t , and an anticipated 65 t of CFC-11 and 34 t of CFC-12 recovered over the first two years of implementation of the

national refrigerator replacement program undertaken in accordance with WEEE legislation now being enacted.

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

These are reviewed in Section 2 above and are based on the rapid implementation of policy and legislative measures to put in place an accelerated domestic refrigerator replacement program based on at least four large regional centres and smaller ones in lower population locations. The system is anticipated to begin initial operation in 2013 and reach a full annual capacity of 250-300,000 units per year in 2015. It will be financed by a combination of extended producer responsibility funds and energy efficiency incentive payments, with possible carbon finance at some future point.

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 primarily on the destruction of contaminated CFCs. However, during the course of implementation, opportunities to also destroy the small quantities of EOL HCFC, HCFC based mixtures, HFCs and CTC that currently exist (Appendix 3) and which will continue to accumulate, particularly as a result of the HPMP implementation will be explored. Halon stocks are being banked for use in the civilian aircraft sector, and no destruction requirements are involved in this work

5.2. Detailed information on issues required for project submission

i. Updated information for issues mentioned under project preparation: Provided in Sections 1 through 4 above

ii. Project Implementation: The project implementation will follow the estimated Timetable:

Table 5 – Overall Implementation Timeline

Activity	2012			2013				2014				2015	
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Project Start-up													
ExCom Project Approval													
Receipt of Funds													
Project/Grant Signature													
Management activities													
Progress Reports to ExCom													
Project Implementation													
Component 1: ODS Destruction Demonstration													
Component 2.0 Technical Assistance													
Component 3.0 Project Management/Monitoring/Evaluation													
Project Closure													
Final Report (Including Output of Sub-component 2.4)													
Certificate of Technical Completion													
Operational and Financial Closure													

iii. Other sources of funding.

The project is estimated to utilize US$1,555,000 in co-financing from other sources. These include budget and in-kind contributions from MADS and participating enterprises (holders of EOL ODS and waste management service providers), initial revenues and startup contributions from government and product manufacturers to the refrigerator replacement program. As noted above (Section 5.1 ii), there are a number of areas the current GEF POPs could contribute to this project. The details of this will be addressed in the PPG currently being initiated for that project, including areas where funding economies might exist. However, given the different nature of the project cycle and eligibility criteria, it is unlikely practical to have these as shared costs. In this discussion, it is emphasized that in this cost estimate there are no costs assigned for MLF funding that would be duplicated in the GEF project. The economies are primarily related to the effectives of the result and in the longer term sustainability of both initiatives.

iv. Concept for monitoring the origin of recovered ODS

The nature of the origin of all EOL ODS recovered for destruction is readily determined given that the currently available stocks are held by their original generators, are derived from well defined activities (customs seizures, refrigeration servicing activities and well documented phase out initiatives (i.e. chiller demonstrative project, MDI conversion, solvent phase out) where recovered material and excess stocks are covered by implementation agreements. These stocks have been and continue to be subject to regulatory monitoring by UTO. The EOL ODS recovered during the start up phase of the national EPR refrigerator replacement program will likewise be closely monitored as it is generated at source. In both cases the tracking of these materials through subsequent consolidation, characterization, storage, transport and destruction is explicitly provided for within the project including detailed documentation. There is no risk in this project or in the subsequent large scale recovery programs to inflate volumes managed with ineligible stocks such as might be generated for purposes of deriving revenues, given there are no such sources, namely production facilities, in Colombia.

While the detailed design of the required EOL ODS Monitoring/Tracking System is part of the proposed project itself and its documentation would in fact be a replicable output, a general outline of the principles and approaches to be applied is provided below:

- *Ensuring EOL ODS cannot be re-used:* In principle, a portion of the EOL managed by the project and the overall WEEE/EPR system can theoretically be re-used, namely any uncontaminated refrigerants and CFC-11 stocks. However, CFC-11 use is effectively banned in Colombia and CFC-12 use in existing equipment is rapidly declining and fully serviced by the present R&R infrastructure. HCFC-22, where recovered, would be re-used as long as a servicing requirement existed. CFC-11 and HCFC-141b in foam is unsuitable for re-use by definition.
- *Verification of source and onward tracking through to destruction – Current EOL ODS Stocks:* The EOL ODS that is earmarked for use in qualifying domestic destruction facilities is currently in the hands of originators, all who can demonstrate where it came from with appropriate documentation. Additionally it is held under the oversight monitoring and

regulatory control of UTO as a hazardous waste in accordance with national legislation. The steps of moving this from these locations through to consolidation/characterization/storage and onward to destruction facilities would involve standard hazardous waste tracking documentation (way-bills/manifests), in/out weighing at each step and analytical verification of consolidated stocks. This would have matching receipt weighting at the incineration facilities and matching against manifest with a final analytical characterization of lots as they were accepted for incineration. The facilities would have metered flow and associated recorders applied to the feed lines from container to primary combustion chamber entry port of the destruction unit as well as provision for purging and verification of containers being empty. This upgrading is specifically provided for in the project. This would definitively measure and allow verification and documentation of the actual amounts entering the process for destruction. By definition the test burn is designed to precisely demonstrate the destruction efficiency of the process by monitoring what is released by any potential path against what is put in.

- *Verification of source and onward tracking through to destruction – EOL ODS Extracted from Replace Equipment:* The source of this EOL ODS would be based initially on record keeping and tracking of collected equipment upon receipt at the dismantling facility through a inventory control system (likely based on bar code labeling applied at source) with the units tracked in the dismantling process. Such tracking would have to be in place in any event for purposes of administering payments under the system. Dedicated refrigerant extraction equipment and containers would be used with recovery containers being uniquely labeled, again with bar code based inventory tracking approach. Foam extracted manually would likewise be bagged and labeled for onward tracking. Shipment of refrigerant containers and bagged foam would be done using hazardous waste transport tracking documentation such as a manifest with receipt confirmation matched in terms of labels and shipping weights. A sampling protocol would also be applied at the incineration facility to verify content at a suitably established frequency which could if 100% in the case of refrigerant basic analyzers were used. Processing tracking would be monitoring at the feed point as described above with the agreed facility rated destruction facility applied, such destruction frequency being tested periodically as required by regulation.
- *Additional considerations associated with possible export and carbon finance arrangements:* The proposed project does not involve export but if it did the same process principles would apply with any additional provisions in terms of manifests, labeling and composition verification required under the Basel Convention and prior consent regulations of export, transit and receiving jurisdictions. The above practices generally meet the monitoring and tracking requirements of the current voluntary carbon credit protocols accepting ODS destroyed by rotary kiln incineration and where a specific commercial arrangement was entered into as may be the case in the future it would be enhanced to meet any specific requirements or procedures specified.

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

Following from the above, the project provides for independent supervision and verification of destruction. This includes development and implementation of protocols for this which will be utilized in the future and will be designed to meet international practice, specifically those applied to carbon crediting arrangements. Assurance of actual effectiveness of destruction as

quantified in destruction efficiency parameters are a specific output of the project applicable to the destruction facilities being qualified, thus a direct validation of their effectiveness is provided.

vi Exploration of other disposal options for the used ODS.

Sections 2 and 3 above provide a discussion of the various strategic and technological destruction options considered for the project. These include the three generic options of export, development of new purpose built facilities and utilizing existing modern domestic hazardous waste management infrastructure in the form of rotary kiln high temperature incineration (HTI). During preparation, the complete range of potentially available technologies associated performance assessments as documented in the technical literature was reviewed, particularly recent publications by the GEF STAP and the most recent TEAP task force report, both referenced above. Preparation of the project also involved inputs from a TEAP Task Force member.

The result of this work supports the selection of both the option of utilizing existing facilities and conventional rotary kiln high temperature incineration technology. HTI remains the technology of choice worldwide for the destruction of halogenated hazardous waste, POPs and ODS. With the strict caution that its operation must be undertaken by competent and creditable operators and it is closely monitored, HTI generally achieves substantially higher destruction efficiencies and lower critical emission levels (i.e. PCDD/F) than required under the TEAP requirements adopted by the Parties and in fact the more strict requirements applied under the Stockholm Convention for POPs. Likewise HTI is generally the lowest cost technology available with destruction costs for chlorinated hazardous wastes in Colombia under US$2.0/kg and which should generally apply to EOL ODS once domestic HTI facilities are qualified. Other technologies that might practically be used in Colombia, namely plasma arc, appear to have substantially higher unit costs (US$12 to 27/kg). While these technologies theoretically might offer higher nominal destruction efficiencies this actually offers minimal actual increase in the amount of ODS destroyed. Notwithstanding the above analysis, the project technical assistance scope has included further technology assessment work related to plasma arc facilities to evaluate its applicability in a full scale refrigerator recovery program as an integrated part of a reverse manufacturing operation and as a possible technology that might also have application to POPs destruction as well as EOL ODS. In the technical reporting detailed in Sub-component 2.4, the technical, environmental and economic performance of the destruction options utilized will be document and compared to experience globally current at that time.

6. Appendixes

Appendix 1: Transmittal Letter

Appendix 2: Legal and Regulatory Framework for ODS in Colombia

Appendix 3: Current National Inventory of End of Life ODS

Appendix 4: Summary of Operating Condition and Environmental Performance Requirements for Hazardous Waste Incineration Facilities in Colombia

Appendix 5: Project Framework and Cost Estimate

Appendix 6: Overall Project Schedule by Component/Sub-Component/Activity

Appendix 1: Transmittal Letter

Appendix 2 – Legal and Regulatory Framework for ODS in Colombia

Colombia is a signatory to the Montreal Protocol on Substances that Deplete the Ozone Layer. The status of the ratification of this protocol and its Amendments is as follows:

Instrument	Congress Law
Vienna Convention (1985)	# 30, 5-Mar-90
Montreal Protocol (1987)	# 29, 28-Dec-92
London Amendment (1990)	# 29, 28-Dec-92
Copenhagen Amendment (1992)	# 306, 5-Aug-96
Montreal Amendment (1997)	# 618, 6-Oct-00
Beijing Amendment (1999)	# 960, 28-Jun-05

1. Control Measurements

In chronological order, the regulations that apply to ODSs are:

- **Law 99 of 1993** (Congress): The Secretary of Environment, *Ministerio del Medio Ambiente*, was created, and the National Environmental System was organized. Environmental licenses -issued by the Secretary of Environment- for the importation and production of substances controlled by international treaties were established.
- **Resolution 528 of June 18, 1997** (Secretaries of Environment and Foreign Trade): The use of CFCs (refrigerant and blowing agent) for the production of domestic refrigerators was banned.
- **Resolution 304 of April 16, 2001** (Secretaries of Environment and Foreign Trade): Imports of ODS listed in the Annex A, Group I, were regulated[13]. Annual quotas per company, defined according to the Country Programme and the import history, were established. NOU approval is required for the expedition of the environmental license.
- **Resolution 734 of June 22, 2004** (Secretaries of Environment -now *Ministerio de Ambiente, Vivienda y Desarrollo Territorial*- and Foreign Trade -now called *Ministerio de Comercio, Industria y Turismo*-): Resolution 304 was modified to take into account the adjusted Country Programme.
- **Resolution 874 of July 23, 2004** (Secretaries of Environment and Foreign Trade): Resolution 734 is expanded. Methodology to quotas allocation is defined.
- **Government Decree 423 of February 21, 2005**: Exports of substances listed in Annex A, Groups I and II, Annex B, Groups I, II and III, Annex C, Groups I, II and III, and Annex E, Group I, are regulated. They required the approval of the Secretary of Environment (UTO)[14].
- **External Resolution 21 of April 1, 2005** (Secretary of Commerce, Industry and Tourism): The approval of UTO (Secretary of Environment) for the imports of HCFCs and Halons is established. The duty positions that require NOU approval are listed: Annex A, Groups I and II, Annex B, Groups I, II and III, Annex C, Groups I, II and III, Annex E, Group I, substitutes for HFCs, refrigerant blends containing ODS and HFCs and blends based on Methyl Bromide.

[13] Unfortunately, substances listed in Annex A, Group II, were not included.

[14] In 2003 it was estimated that 12 % of the imported ODS were exported.

- **External Resolution 22 of April 1, 2005** (Secretary of Commerce, Industry and Tourism): The exports of substances listed in Annex A, Groups I and II, Annex B, Groups I, II and III, Annex C, Groups I, II and III, and Annex E, Group I are regulated. The Secretary of Environment (UTO) should established annual quotas per substance.
- **External Resolution 23 of April 7, 2005** (Secretary of Commerce, Industry and Tourism): The list of duty positions belonging to domestic refrigerators and freezers, whose imports require UTO approval, is updated.
- **Resolution 2188 of December 29, 2005** (Secretary of Environment): Exports are regulated with reference to Decree 423.
- **Resolution 901 of May 23, 2006** (Secretary of Environment): Imports of ODS listed in the Annex A, Group II, Halons, were regulated. Annual quotas per company, defined according to the Country Programme and the import history, were established. The use of halons in new installations was banned.
- **Resolution 902 of May 23, 2006** (Secretary of Environment): Imports of ODS listed in the Annex B, Group I, II and III, were regulated. Annual quotas per company, defined according to the Country Programme and the import history, were established. The use of halons in new installations was banned.
- Since 1999 HCFCs imports require environmental license.
- **Resolutión 2120 of October 31, 2006** (Secretary of Environment): Establish the measurements to control Annex C substances.

Since December 2005 Colombia has an overall policy for the management of hazardous waste, where ODSs are included. This policy is covered in the **Decree 4741 of 2005** based on the implementation of the Basel Convention.

Appendix 3 – Current National Inventory of End of Life ODS

Source	Quality	Ownership/Control	Location	Current Storage Condition	Quantity (kg)
CFC-11					
Phase 1(a) - Chiller replacement program – Q1/2 2012	Recovered CFC-11	- MLF project legal agreement obligation to hold for destruction - UTO monitoring	Cali	210 l drums	370
Phase 1(b)- Chiller replacement program – Q3/4 2012	Recovered CFC-11	- MLF project legal agreement obligation to hold for destruction - UTO monitoring	Medellín	210 l drums	530
Phase 2(a) - Chiller replacement program – Q1/2 2013	Recovered CFC-11	- MLF project legal agreement to hold for destruction - UTO monitoring	Medellín	210 l drums	500
Phase 2(b) - Chiller replacement program – Q3/4 2013	Recovered CFC-11	- MLF project legal agreement to hold for destruction - UTO monitoring	Medellín	210 l drums	2,600
LABORATORIOS CHALVER DE COLOMBIA (MDI manufacturer)	Pure CFC-11	- LABORATORIOS CHALVER DE COLOMBIA (MDI manufacturer) - MLF project legal agreement to hold for destruction/UTO monitoring	Bogota	57 kg cylinder	1,367
Excess Stocks in held by phased out users	Pure and recovered CFC-11	- Excess stocks at 5 users - Availability being confirmed	Bogota, Cali, Cartagena, Rionegro, Ibague	Various containers	456
Stocks at bankrupt former users	Pure and recovered CFC-11	- Excess stocks at 2 bankrupt users - Availability being confirmed	Espinal y Barranquilla	Various containers	2,297
CFC-11 Totals					8,120
Immediately Available					1,823
Availability being confirmed					2,297
Availability – end of 2012					900
Availability –end of 2013					3,100

Source	Quality	Ownership/Control	Location	Current Storage Condition	Quantity (kg)
CFC-12					
Regional Recover and Recycling Centers and Reclaim Centers	Contaminated reclaim/servicing residuals CFC-12 (separated)	- Held by 16 refrigeration service providers - UTO registration and monitoring - Supply to project committed	Regional Reclaim Centers - 10 locations	13.6 kg cylinders	236
Regional Recover and Recycling Centers and Reclaim Centers	Contaminated reclaim/servicing CFC-12 residuals (>70%)	- Held by 35 refrigeration service providers - UTO registration and monitoring - Supply to project committed	Regional Reclaim Centers – 18 locations	13.6 kg cylinders	1,142
National Customs – DIAN	CFC-12 and mixtures of CFC-12 seized	- Held by 5 regional customs offices	Regional customs offices – 5 locations	13.6 kg cylinders and 340 g cans	1,500
LITO	Contaminated reclaim/servicing CFC-12 residuals->70%	- Held or accessible by national service provider (LITO) - UTO registration and monitoring - Supply to project committed	LITO Storage Site - Bogota	13.6 kg cylinders	1,246
LABORATORIO CHALVER DE COLOMBIA (MDI manufacturer)	Pure CFC-12	- MLF project legal agreement to hold for destruction/UTO monitoring	Bogota	13.6 kg cylinders	1,550
CFC-12 and CFC-12 mixtures Totals					5,674
Available immediately					5,674

Source	Quality	Ownership/Control	Location	Current Storage Condition	Quantity (kg)
HCFC, HFC and mixtures of HCFC - HFC					
Regional Recover and Recycling Centers and Reclaim Centers	Contaminated reclaim/servicing residuals HCFC-22 (separated)	- Held by 15 refrigeration service providers - UTO registration and monitoring - Supply to project committed	Regional Reclaim Centers and end users - 9 locations	13.6 kg cylinders	336
Regional Recover and Recycling Centers and Reclaim Centers	Contaminated reclaim/servicing residuals HFC-134a (separated)	- Held by 11 refrigeration service providers - UTO registration and monitoring - Supply to project committed	Regional Reclaim Centers and end users - 8 locations	13.6 kg cylinders	204
Regional Recover and Recycling Centers and Reclaim Centers	Contaminated reclaim/servicing residuals mixtures of HCFCs and other HFCs	- Held by 7 refrigeration service providers - UTO registration and monitoring - Supply to project committed	Regional Reclaim Centers and end users- 3 locations	13.6 kg cylinders	379
HCFC, HFC and mixtures of HCFC - HFC Totals					919
Available immediately					919

Source	Quality	Ownership/Control	Location	Current Storage Condition	Quantity (kg)
CTC					
Pure CTC	MLF project legal agreement to hold for destruction/UTO monitoring		Cali	210 l drum	330
CTC Total					330
Available immediately					330

Appendix 4 – Summary of Operating Condition and Environmental Performance Requirements for Hazardous Waste Incineration Facilities in Colombia

Requirement	Capacity > 500 kg/hr	Capacity < 500 kg/hr
Combustion chamber temp. (^oC)		
Primary	> 850	> 1200
Secondary	> 800	> 1100
Secondary combustion chamber residence time (sec)	> 2 sec.	> 2 sec
Gas exhaust temp. (^oC)	< 250	<250
Air Emissions (O_2 reference @11%) – mg/m^3		
Particulate	Av. Day - 10 Av. Hr. - 20	Av. Day - 15 Av. Hr. - 30
SO_2	Av. Day - 50 Av. Hr. - 300	Av Day - 50 Av. Hr. - 200
NO_x	Av. Day - 200 Av. Hr. - 400	Av. Day - 200 Av. Hr. - 400
CO	Av, Day - 50 Av. Hr. - 100	Av. Day - 50 Av. Hr. - 100
HCL	Av. Day - 10 Av. Hr. - 40	Av. Day - 15 Av. Hr. - 60
HF	Av. Day - 1 Av. Hr. - 4	Av. Day - 1 Av. Hr. - 4
Hg	Av. Day - 0.03 Av. Hr. - 0.05	Av. Day - 0.05 Av. Hr. - 0.10
Total hydrocarbons	Av. Day - 10 Av. Hr. - 20	Av. Day - 10 Av. Hr. – 20
PCDD/F (ng – $ITEQ/m^3$)	0.1	0.1
Air Emission Heavy Metals (Reference Conditions 25^oC, 760 mm Hg) - mg/m^3		
Sum of Ca, Tl, and its compounds	0.5	0.5
Sum of As, Cu, Cr, Pb, Co, Ni, V, Mn, Sb, Sn	0.5	0.5
Destruction Performance		
DRE –Waste (%)	99.99	99.99
DRE – HCl (%)	99	99

Appendix 5: Detailed Project Framework and Indicative Cost Estimate

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
Component 1: ODS Destruction Demonstration		830,000	1,235,000	2,065,000	
1.1 Consolidation/storage/characterization/transport of CFC-11 and CFC-12 EOL ODS		100,000	50,000	150,000	Q3/4 2012
1.1.1 Supply of extraction/transfer equipment and ODS analyzers	Four recovery machines with N_2 purge capability and associated tools. Four ODS analyzers	20,000	20,000	40,000	Q3 2012
1.1.2 Supply of bulk cylinders	Sufficient multiple use cylinders of size optimized for qualified destruction facilities.	15,000	15,000	30,000	Q3 2012
1.1.3 Collection/transport of distributed CFC- 11 stocks	Pick up of CFC-11 as currently stored from chiller sites, bankrupt enterprises, former user enterprises and LABORATORIO CHALVER for delivery to contracted project consolidation/storage site (s)	-	5,000	5,000	Q4 2012
1.1.4 Collection/transport of distributed CFC- 12 stocks	Pick up of CFC-12 as currently stored at reclaim center/national customs, LITO and LABORATORIO CHALVER and delivered to contracted project consolidation/storage site (s)	-	10,000	10,000	Q4 2012
1.1.5 Consolidation/storage of CFC-11 stocks	Screening analysis, consolidating into optimized cylinders for destruction and secure monitored storage at a contracted project site	10,000	-	10,000	Q4 2012
1,1.6 Consolidation/storage of CFC-12 stocks at contracted project storage site	Screening analysis, consolidating into optimized cylinders for destruction and secure monitored storage at a contracted project site	10,000	-	10,000	Q4 2012
1.1.7 Verification analysis of consolidated CFC-11 and CFC-12	Independent laboratory analysis of consolidated EOL ODS in each bulk cylinder.	20,000	-	20,000	Q4 2012
1.1.8 Transportation to incineration facility	Transport as required by test burn schedule	15,000	-	15,000	Q3 2013
1.19 Documentation and reporting	Assembly of auditable documentation on the origin, tracking and certified analysis of EOL ODS for test burns stocks in suitable for accreditation under an international carbon crediting mechanism.	10,000	-	10,000	Q4 2012-Q1 2013
1.2 Consolidation/storage/characterization/transport of CFC-11 containing Foam for test burn demonstrations		100,000	-	100,000	Q4 2012-Q1 2013
1.2.1 Test burn foam separation, and storage	Contractor set up to extract, and bag foam at scrap yards inclusive of secure onsite storage or	60,000	-	60,000	Q1 2013

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
	other interim storage				
1.2.2 Transportation	Transportation to incineration facilities and interim storage as required	15,000	-	15,000	Q2 2013
1.2.3 Site screening of extracted foam.	Supply of ODS screening equipment for foam/Contracted service for screening	10,000	-	10,000	Q4 2012-Q1 2013
1.2.4 CFC -11 content analysis	Contracted verification analysis of CFC-11 content	15,000	-	15,000	Q2 2013
1.3 Test Burn Demonstrations for CFC-11 and CFC-12 at selected HW incinerators		250,000	165,000	415,000	Q3 2013
1.3.1 Test burn planning and design	Detailed test burn design, specification and proposal documents including baseline environmental audit for each (2) test burn facility.	20,000	30,000	50,000	Q3 2012-Q2 2013 Enterprise in-kind and co-finance of baseline EA Potential economies with GEF POPs project
1.3.2 Minor facility modifications	Material feed, control and measurement infrastructure at HW incineration facility - Primary combustion chamber port modifications for high vapor pressure liquid and/or compressed gas feed - Dedicated liquid feed from barrels or containers inclusive of weight scale, pump, fugitive emission containment, flow controls and flow metering - Dedicated gaseous feed from pressurized containers inclusive of weight scale, pump, fugitive emission containment, flow controls and flow metering - Container purging capability	30,000	10,000	40,000	Q2 2013 Enterprise in-kind Potential economies with GEF POPs project
1.3.3 Baseline feed selection/characterization	Selection/characterization of a representative baseline feed to be co-disposed with ODS	10,000	10,000	20,000	Q3 2013 Enterprise in-kind including characterization analysis.
1.3.4 Baseline test burn	Baseline test burn on representative normal feed mix	50,000	25,000	75,000	Q3/4 2013 Enterprise in-kind

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
	- Incineration facility operating conditions - Stack analysis for regulated emissions including HF and PCCD/F - Bottom ash analysis - Scrubber waste water (as applicable) analysis				Potential economies with GEF POPs project
1.3.5 Test burn for CFC-11	Continuous metered injection of 5 t of CFC-11 at pre determined rates with monitoring and documentation of: - Incineration facility operating conditions - Stack analysis for regulated emissions plus HF and PCCD/F - Bottom ash analysis - Scrubber waste water (as applicable) analysis	60,000	45,000	105,000	Q3/4 2013 Enterprise in-kind for operational, permitting and result audit documentation costs
1.3.6 Test burn for CFC-12	Continuous metered injection of 5 t of CFC-12 at pre determined rates with monitoring and documentation of: - Incineration facility operating conditions - Stack analysis for regulated emissions plus HF and PCCD/F - Bottom ash analysis - Scrubber waste water (as applicable) analysis	60,000	45,000	105,000	Q3/4 2013 Enterprise in-kind for operational, permitting and result audit documentation costs
1.3.7 Test burn supervision	Independent supervisory/audit consultant(s) undertaking test burn oversight, data analysis and reporting.	20,000	-	20,000	Q2 –Q4 2013 Potential economies with GEF POPs project
1.4 Test Burn Demonstration - for CFC-11 containing foam at two selected Industrial/HW Incineration Facilities		135,000	80,000	215,000	Q2 2013
1.4.1 Test burn planning and design	Detailed test burn design, specification and proposal documents for test burns including baseline environmental audit.	20,000	20,000	40,000	Q4 2012-Q1 2013 Enterprise in-kind and co-finance of baseline EA .
1.4.2 Minor facility modifications	Material feed, control and measurement infrastructure at HW incineration facility (assumed existing bulk solid feed systems with minimal modification)	-	10,000	10,000	Q1 2013 Enterprise in-kind
1.4.3 Test burn on CFC-11 containing foam	Test burn on 5t of foam at two qualified facilities:	100,000	50,000	150,000	Q2 2013

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
	- Incineration facility operating conditions - Stack analysis for regulated emissions including HF and PCCD/F - Bottom ash analysis - Scrubber waste water (as applicable) analysis				Enterprise in-kind
1.4.4 Test burn supervision	Independent supervisory/audit consultant(s) undertaking test burn oversight, data analysis and reporting.	20,000	-	20,000	Q4 2012-Q3 2103
1.5 Destruction of EPR Program Start up volumes of CFC-12 and CFC-11 containing foams (Based on 300,000 units, 34 t CFC-12, 65 t CFC-11 in 1,228 t of foam)		245,000	940,000	1,185,000	Q1 2014 –Q4 2014
1.5.1 EOL ODS collection, extraction, consolidation and transport	Collection, extraction, storage, consolidation, and transport of CFC-12 and CFC-11 containing foam to qualified incineration facilities	-	400,000	400,000	Q2 2013-Q3 201
1.5.2 CFC-12 destruction	Destruction of 34 t of CFC-12 @ commercial rate of $2,000/t	70,000	-	70,000	Q3 2014 Assume70% CFC-12 recovery
1.5.3 CFC-11 containing foam destruction	Destruction of 1,228 t of CFC-11 containing foam (assumed contain 45 t CFC-11) @ commercial rate of $ 500/t	100,000	465,000	565,000	Q4 2014 Assume 75% CFC-11 retained in destroyed foam
1.5.4 High efficiency CFC-12 recovery equipment	Supply of high efficiency CFC recovery unit with oil and refrigerant circuit de-gassing and multiple stations.	50,000	50,000	100,000	Q1 2014 Assume two large manual dismantling operations each with one unit 50% co-financed by MILF
1.5.5 Reporting of commercial ODS destruction under the EPR Program start up	Preparation of consolidated documentation and verification protocols for routine assembly of auditable documentation on the origin, tracking, certified analysis and destruction of EOL stocks in suitable for accreditation under an international carbon crediting mechanism	20,000	25,000	50,000	Q1 2015
Component 2.0 Technical Assistance		255,000	150,000	405,000	Q3 2012-Q1 2014

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
2.1 Legal and regulatory institutional TA	Support for legal and regulatory enabling measures facilitating development and implementation of the national EOL management system - Legislation/regulation banning release of ODS and requiring its registered storage and environmentally sound destruction. - Regulatory technical guidance in support of collection, storage, analysis, tracking, certified destruction and reporting requirements applicable to the management of EOL ODS. - Legislation/regulation of the technical criteria and specifications for the facilities managing EOL ODS - Legislation/regulation for the EPR system	50,000	25,000	75,000	Q3 2012-Q2 2013 Potential economies with GEF POPs project
2.2 Technical/business planning support for EOL ODS Management under the EPR system	Support for technical/business planning and administration of the developing EOL ODS aspects of the EPR system - Training and Technical Support for Operational EOL ODS Management - Technology option assessment for future EOL ODS processing and destruction - Development of sustainable carbon crediting mechanisms for EOL ODS	75,000	100,000	175,000	Q3 2012-Q3 2013
2.3 Public Consultation and Information	Support for stakeholder and public consultations and awareness development on the national EOLODS management system development and implementation - Information products/public promotion - Stakeholder workshops	50,000	25,000	75,000	Q3 2012-Q1 2014 Potential economies with GEF POPs project
2.4 Technical Oversight and Overall Project Technical Report	Part-time international consultant with expertise in hazardous waste and WEE management to provide: - Oversight and technical advice on the overall project implementation - Critical review if technical assistance products, specifically processing and	80,000	-	80,000	Q3 2012-Q2 2015

Component/Sub-Component	Activity Description	Cost Estimate (US$)			Timing/Remarks
		MLF	Other	Total	
	technology destruction evaluations, WEEE/EPR system implementation and introduction of carbon finance; - A detailed technical completion report documenting project's results (facility baseline, kiln modifications, test burn procedures, performance against reference standards); life cycle tracking procedures and results; comparative analysis with other global experience and recommendations for use by ExCom and the Parties in advancing and replicating this experience report upon completion.				
Component 3.0 Project Management/Monitoring/Evaluation		110,000	170,000	280,000	Q3 2012-Q2 2015
3.1 National Project Coordinator	National expert on ODS, hazardous waste and WEEE management with overall responsibility for project coordination, reporting to UTO NOU, and working in close cooperation with GEF POPs project PMU	60,000	60,000	120,000	Q2 2012-Q1 2015 Full time 2.5 years
3.2 Project office administration	Project office administrative staffing, office and related overheads	-	60,000	60,000	Q2 2012-Q1 2015 Gov. in-kind Shared costs with GEF POPs project
3.3 Misc. contract services and travel	Project documentation,/translation and local project management travel	20,000	20,000	40,000	Q2 2012-Q4 2014 Gov. in-kind
3.4 M&E costs	Contracted national and international M&E costs	30,000	30,000	60,000	Q2 2012-Q2 2015
Totals		1,195,000	1,555,000	2,750,000	

Appendix 6: Overall Project Schedule by Component/Sub-Component/Activity

Project Component/Sub-Component/Activity	2012		2013				2014				2015	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Component 1: ODS Destruction Demonstration												
1.1 Consolidation/storage/characterization/transport of CFC-11 and CFC-12 EOL ODS												
1.1.1 Supply of extraction/transfer equipment and ODS analyzers												
1.1.2 Supply of bulk cylinders												
1.1.3 Collection/transport of distributed CFC- 11 stocks												
1.1.4 Collection/transport of distributed CFC- 12 stocks												
1.1.5 Consolidation/storage of CFC-11 stocks												
1,1.6 Consolidation/storage of CFC-12 stocks												
1.1.7 Verification analysis of consolidated CFC-11 and CFC-12												
1.1.8 Transportation to incineration facility												
1.19 Documentation and reporting												
1.2 Manual processing- CFC-11 refrigeration equipment at scrap yards to produce 10-15 t of CFC-11 containing foam												
1.2.1 Test burn foam separation, and storage												
1.2.2 Transportation												
1.2.3 Site screening of extracted foam.												
1.2.4 CFC -11 content analysis												
1.3 Test Burn Demonstrations for CFC-11 and CFC-12 at selected HW incinerators												
1.3.1 Test burn planning and design												
1.3.2 Minor facility modifications												
1.3.3 Baseline feed selection/characterization												
1.3.4 Baseline test burn												
1.3.5 Test burn for CFC-11												
1.3.6 Test burn for CFC-12												
1.3.7 Test burn supervision												
1.4 Test Burn Demonstration - for CFC-11 containing foam at two selected Industrial/HW Incineration Facilities												
1.4.1 Test burn planning and design												
1.4.2 Minor facility modifications												
1.4.3 Test burn on CFC-11 containing foam												
1.4.4 Test burn supervision												
1.5 Destruction of EPR Program Start up volumes of CFC-12 and CFC-11 containing foams												
1.5.1 EOL ODS collection, extraction, consolidation and transport												
1.5.2 CFC-12 destruction												
1.5.3 CFC-11 containing foam destruction												

Project Component/Sub-Component/Activity	2012		2013				2014				2015	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1.5.4 High efficiency CFC-12 recovery equipment												
1.5.5 Reporting of commercial ODS destruction												
Component 2.0 Technical Assistance												
2.1 Legal and regulatory institutional TA												
2.2 Technical/business planning support for EOL ODS Management												
2.3 Public Consultation and Information												
2.4 Technical Oversight and Overall Project Technical Report												
Component 3.0 Project Management/Monitoring/Evaluation												