



**Programa de las
Naciones Unidas
para el Medio Ambiente**



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COMITÉ EJECUTIVO DEL FONDO MULTILATERAL
PARA LA APLICACIÓN DEL
PROTOCOLO DE MONTREAL
Septuagésima sexta Reunión
Montreal, 9 – 13 de mayo de 2016

PROPUESTA DE PROYECTO: KUWAIT

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

Equipos de refrigeración

- Proyecto de demostración del desempeño de la tecnología de bajo PCA sin HCFC en aplicaciones de climatización.

PNUD

HOJA DE EVALUACIÓN DE PROYECTO – PROYECTO NO PLURIANUAL**KUWAIT****TÍTULO DEL PROYECTO****ORGANISMO BILATERAL/DE EJECUCIÓN**

a) Proyecto de demostración del desempeño de la tecnología de bajo PCA sin HCFC en aplicaciones de climatización.	PNUD
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ORGANISMO DE COORDINACIÓN NACIONAL

KISR

DATOS DEL CONSUMO DE SAO MÁS RECIENTES QUE SE RECOGEN EN EL PROYECTO**A: DATOS ATINENTES AL ARTÍCULO-7 (TONELADAS PAO, 2014, A OCTUBRE DE 2015)**

HCFC	336,17
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B: DATOS SECTORIALES DEL PROGRAMA DE PAÍS (TONELADAS PAO, 2014, A SEPTIEMBRE DE 2015)

HCFC-22	187,00
HCFC-123	0,05
HCFC-141b	80,85
HCFC-142b	71,50
HCFC-141b en forma de polioles premezclados de importación	59,95

HCFC-22 consumo remanente admisible para financiación (toneladas PAO)

179,25

ASIGNACIONES EN EL PLAN ADMINISTRATIVO PARA EL AÑO EN CURSO		Financiación \$EUA	Eliminación de toneladas PAO
a)		n.c.	n.c.

TÍTULO DEL PROYECTO:	
SAO consumidas en empresas (toneladas PAO):	n.c.
SAO a eliminar (toneladas PAO):	n.c.
SAO a introducir (toneladas PAO):	n.c.
Duración del proyecto (meses):	36
Monto solicitado inicialmente (\$EUA):	343 000
Costos finales del proyecto (\$EUA):	293 000
Costo adicional de capital:	n.c.
Gastos imprevistos (10 %):	n.c.
Costo adicional de explotación:	n.c.
Costo total del proyecto:	293 000
Propiedad local (%):	100
Componente de exportación (%):	0
Donación solicitada (\$EUA):	293 000
Rentabilidad (\$EUA /kg):	n.c.
Gastos de apoyo para el organismo de ejecución (\$EUA):	20 510
Costo total del proyecto para el Fondo Multilateral (\$EUA):	313 510
Situación de la financiación de contraparte (S/N):	N
Hitos de supervisión del proyecto incluidos (S/N):	Y

RECOMENDACIONES DE LA SECRETARÍA

Para consideración individual

DESCRIPCIÓN DEL PROYECTO

1. En nombre del Gobierno de Kuwait, el PNUD, en calidad de organismo de ejecución designado ha presentado a la 76ª reunión una solicitud de financiación para un proyecto de demostración destinado a evaluar el desempeño de tecnologías de bajo PCA formuladas sin HCFC en aplicaciones de climatización, por un monto que asciende a 343 000 \$EUA, más costos de apoyo al organismo por valor de 24 010 \$EUA conforme a su presentación original¹. La propuesta de proyecto se adjunta como anexo I al presente documento.

Objetivo del proyecto

2. Los Países con elevadas temperaturas ambiente (ETA) tienen una gran demanda de equipos de climatización, la mayoría de los que funcionan con HCFC-22 como refrigerante. Por ejemplo, en el caso de Kuwait aproximadamente el 45 por ciento de los HCFC-22 consumidos en 2014 se consumieron predominantemente en tareas de servicio y mantenimiento de equipos de climatización. Esta creciente demanda de consumo de HCFC justifica la necesidad de demostrar el desempeño de los sistemas de climatización de bajo PCA formulados sin HCFC que existen actualmente.

3. Partiendo de este hecho, el proyecto de demostración se propone evaluar el desempeño de dos tipos de equipos de climatización que actualmente pueden obtenerse comercialmente: un sistema de climatización de 8 toneladas de capacidad con formulación de HFC-32; y un mini sistema enfriador de refrigeración de 40 toneladas de capacidad con formulación de HC-290. El equipo se instalará en cuatro emplazamientos que se seleccionarán bajo consultas con los peritos, la Dependencia Nacional del Ozono y la entidad Investigación científica e industrial de Kuwait (KISR). Se supervisará y evaluará el desempeño de cada tipo de equipo, teniendo en cuenta, entre otras cosas, el desempeño de los compresores, condensadores, evaporadores, consumo energético eficiente y consumo de potencia, y se compararán con equipos formulados con HCFC-22 y R-410 de similar envergadura y capacidad.

4. Una vez culminado el proyecto, sus resultados podrían reproducirse en Kuwait y en países con condiciones ETA. Con objeto de facilitar la adopción de los equipos y de la tecnología demostrada, y a fin de respaldar las políticas-normativas y reglamentos reguladores conexos a su aplicación en tales países de condiciones ETA, se ha propuesto impartir talleres técnicos regionales en los que se faciliten los pormenores del desempeño de los productos.

Ejecución del proyecto

5. El proyecto de demostración se ejecutará como sigue:

- a) Instalación del equipo de enfriador formulado con HC-290 y del equipo climatizador formulado con HFC-32, incluyendo los equipos de supervisión, en cuatro emplazamientos diferentes (a saber: una mezquita, un establecimiento comercial situado en la costa, en KISR, y en una vivienda privada);
- b) Evaluación del desempeño y verificación del equipo por espacio de dos veranos; y
- c) Distribución de los resultados que se deriven del proyecto de demostración en las reuniones internacionales y regionales.

6. El proyecto de demostración lo ejecutará y supervisará la KISR bajo la supervisión de la Dependencia Nacional del Ozono, y se prevé esté terminado en 36 meses.

¹ La financiación para la preparación de este proyecto se aprobó en la 74ª reunión por un monto de 20 000 \$EUA, más gastos de apoyo al organismo por valor de 1 400 \$EUA, dándose por entendido que su aprobación no implicaba la aprobación del proyecto ni de su nivel de financiación conforme a su presentación original (decisión 74/26).

Presupuesto para el proyecto

7. El costo total del proyecto se ha estimado en 343 000 \$EUA más una contribución en especies por valor de 25 000 \$EUA aportada por el Gobierno, como se muestra en el Cuadro 1.

Cuadro 1. Costo del Proyecto propuesto

Actividad	Presupuesto (\$EUA)
Adquisición e instalación del equipo	
Unidad de demostración de HFC-32	18 000
Mini enfriador de demostración de HC-290	40 000
Equipo de supervisión (por ejemplo, registrador cronológico de datos)	60 000
Armarito para albergar el sistema de supervisión	25 000
Ejecución y supervisión	
Capacitación para la supervisión y la gestión del proyecto	10 000
Apoyo técnico para la verificación (compuesto por un investigador, un profesional, un técnico y un administrador)	100 000
Peritos	40 000
Divulgación de la información	
Taller (subregional, con la participación de 15 países)	50 000
Suma total	343 000
Fondos de financiación pedidos al Fondo Multilateral	
Contribución en especies (personal y coordinación local)	25 000

OBSERVACIONES Y RECOMENDACIONES DE LA SECRETARÍA**OBSERVACIONES**

8. Como el PNUD ha explicado, la selección de la tecnología se fundamentó en las deliberaciones con los fabricantes de los equipos con el fin de seleccionar aquellos tipos de equipos que han demostrado buenas prestaciones en condiciones de laboratorio, pero que no se han empleado aún ni comprobado en condiciones ETA. El equipo se adquirirá por licitación conforme a las especificaciones que se definirán tras aprobarse el proyecto.

9. Se reconoció durante el proceso de examen del proyecto la falta de normas para usar refrigerantes inflamables en el país; sin embargo, el Gobierno considera que el proyecto de demostración facilitará el establecimiento de tales normas, incluyendo las conexas a la introducción de equipos que funcionen con refrigerantes de PCA bajo. Este planteamiento puede reproducirse fácilmente en los países del Golfo en los que la cooperación regional es bastante intensa.

10. En lo tocante a una mayor racionalización del costo del proyecto², el PNUD lo ajustó reduciendo 30 000 \$EUA para apoyo técnico y 20 000 \$EUA para talleres. El costo del proyecto final que se solicita al Fondo Multilateral asciende a 293 000 \$EUA, más gastos de apoyo al organismo.

² Sirviéndose de la decisión 74/21 c), se pidió a los organismos bilaterales y de ejecución que racionalizaran los costos de los proyectos de demostración a fin de poder aprobar un mayor número de ellos en el marco de la financiación disponible de 10 millones de \$EUA, en sintonía con la decisión 72/40, y además para poder explorar ulteriormente otras fuentes de financiación adicionales.

Conclusiones

11. El proyecto de demostración está intensamente vinculado con el desarrollo de una mayor estrategia para el sector de servicio y mantenimiento en la etapa II del Plan de gestión de eliminación de los HCFC para Kuwait. De tener éxito, aportará un potencial para la introducción de equipos de climatización de PCA bajo en todos los países en condiciones ETA.

RECOMENDACIONES

12. El Comité Ejecutivo puede estimar oportuno:

- a) El proyecto de demostración destinado a evaluar el desempeño de tecnologías de bajo PCA formuladas sin HCFC en aplicaciones de climatización en Kuwait, en el marco de sus debates sobre las propuestas para proyectos de demostración destinados a tecnologías de bajo PCA alternativas a los HCFC, como se describió en el documento Reseña de las cuestiones identificadas durante el examen de proyectos (UNEP/OzL.Pro/ExCom/76/12);
- b) Aprobar el Proyecto de demostración para evaluar el desempeño de tecnologías de bajo PCA y formuladas sin HCFC en aplicaciones de climatización en Kuwait, por el monto de 293 000\$EUA, más gastos de apoyo al organismo por valor de 20 510 \$EAU para el PNUD, conforme a la decisión 72/40; e
- c) Instar al Gobierno de Kuwait y al PNUD a terminar el proyecto en 36 meses, como se había planificado, y a presentar un informe final general a la mayor brevedad posible tras la terminación de dicho proyecto.

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

Annex I

PROJECT COVER SHEET - NON-MULTI-YEAR INVESTMENT PROJECTS

COUNTRY: KUWAIT

PROJECT TITLE:

Demonstration Project for HCFC-free low-GWP technology performance in air-conditioning applications (capacity above 8 TR)

IMPLEMENTING AGENCY:

UNDP

PROJECT DATA			
Sector:	Air-conditioning sector		
Sub-sector:	Residential / Commercial acs (More than 8 TR)		
ODS use in sector (2014 metric tonnes):			3373.63
Project impact (metric tonnes : a portion of equiv.):			2500
Project duration:			36 months
Project Costs:	Incremental Capital Costs(including contingencies):	US\$	343,000
	Incremental Operating Costs:	US\$	0
	Total Costs:	US\$	343,000
Local ownership:			100%
Exports to non-A5 countries:			0%
Request grant		US\$	343,000
Counterpart fund		US\$	NA
Cost-effectiveness (US\$/kg-ODS):			
Implementing agency support costs:		US\$	24,010
Total Cost to Multilateral Fund:		US\$	367,010
Status of counterpart funding (Yes/No):			NA
Project monitoring milestones included (Yes/No):			Yes

PROJECT SUMMARY

This demonstration project, upon successful completion, will establish the suitability of HCFC-free low-GWP technology performance in air-conditioning applications (capacity above 8 TR) in high ambient temperature conditions. The capacity of equipment are chosen in accordance with the type of existing equipment used in Kuwait. The project will cover installation of equipment using HFC-32 and R-290 based technology in Kuwait in identified locations and testing their performance over time. The project would be implemented by the National Ozone Unit of Kuwait with technical support from experts and Kuwait Institute of Scientific Research. Input from other projects in the regional will be used while structuring the implementation modality of this project.

If successful, the demonstration project will contribute towards reduction in consumption of HCFC-22 based air-conditioning installations besides reduction in installation of R-410A based equipment. This will have an impact on approximately 50,000 households consuming 50 TR each (approx.) of air-conditioning that would be constructed in the future, besides replacement of existing equipment using HCFCs and HFCs. The consumption in air-conditioning applications in the country in servicing as of the year 2015 is about 2500 MT and a significant portion of this will be addressed by this project.

Prepared by: UNDP in consultation with National Ozone Unit and industry

Date: March 2016

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PROJECT OF THE GOVERNMENT OF KUWAIT
Demonstration Project for HCFC-free low-GWP technology performance in
air-conditioning applications (capacity above 8 TR)

Objective

The objective of this proposed demonstration project is to install commercially available air-conditioning equipment in selected locations in residential areas in Kuwait with HCFC free low-GWP technologies (e.g., HFC-32, R-290), test performance of these equipment in prevailing conditions in Kuwait over two seasons of summer and disseminate test results to other interested stakeholders – both national and international.

HPMP Stage-I is under implementation in Kuwait. While implementing HPMP Stage-I, it was observed that the country faces a significant challenge (like other similar countries in the region and across the globe) on adoption of low GWP ozone friendly air-conditioning equipment. Specific activities to address this are not included in the HPMP Stage-I document as HPMP Stage-I focuses more on compliance with HCFC phase-out targets. Therefore, this demonstration project is expected to be helpful for the Government of Kuwait and other developing countries having similar operating conditions.

Sector Background

Introduction

Air-conditioning is a very important need for countries in the Middle East like Kuwait where ambient temperature can cross 50 degrees centigrade or more during summer months. Currently, HCFC-22 is widely used in this region for their air-conditioning equipment households. Given the larger size of households in Kuwait, the capacity of these equipment is of the range of upto 30 TR or more. On an average, the equipment are much larger in capacity compared to air-conditioners used in other countries in Asia Pacific region.

Technologies air-conditioning applications for high ambient temperature have been a challenge. These have been highlighted and discussed in different for a since 2007. In the recent TEAP report presented in 26th MOP in Paris in November 2014, it has been highlighted that availability of HCFC free alternative technologies in air-conditioning applications is limited. It is known that low GWP safe to use options pose unique challenge. As of date, HFC-32 and R-290 based products are commercially available for high capacity equipment required for this project. There is limited information available on other low GWP options (e.g., HFOs, blends) as of date in terms of commercial availability.

It is known that some of the technology options mentioned in paragraph above are available in Article 5 countries. Their adoption is still limited due to a range of reasons including standards and market promotion of such options.

The market for these air-conditioning equipment is growing at high rate in Kuwait and this growth is mainly on account of increase in number of households in the country. To avoid dependence of HCFC-22 based equipment that would result in prolonged use of HCFC-22 in servicing, it is essential for the country to demonstrate performance of HCFC free low-GWP technologies for adoption in households. The results would be replicable not only in Kuwait but also in other countries in the region and other parts of the world, where high-ambient temperature conditions are experienced during summer months.

Brief project summary

The project would involve installation of air-conditioning equipment in selected locations in residential areas in Kuwait with HCFC free low-GWP technologies (e.g., HFC-32, R-290), testing performance of these equipment in prevailing conditions in Kuwait over two seasons of summer and dissemination of test results to other interested stakeholders – both national and international.

Alternative Technology Options

The following factors need to be considered for selection of the alternative technology:

Technical factors

- Processing characteristics
- Functionality in end-product
- Proven and mature technology
- Energy efficiency

Commercial factors

- Cost-effectiveness
- Reliable availability

Health and safety factors

- Low risk for occupational health
- Low risk for physical safety (flammability, etc.)

Environmental factors

- Direct ozone impacts
- Direct and indirect climate impacts

Some of the zero-ODP alternatives to HCFC-22 currently available for air-conditioning applications are given below.

Substance	GWP	Application	Remark
R-410A		Residential / commercial acs	Widely available commercially. High GWP technology option compared to some of the alternatives available in the market. Energy efficiency is high and improved energy performance models are under development.
R-407C		Residential / commercial acs	Widely available commercially. High GWP technology option compared to some of the alternatives available in the market. Energy efficiency is high and improved energy performance models are under development.
R-32		Residential / commercial acs	Commercially available though not as widely as R-410A or R-407C. Mildly flammable refrigerant and has lower GWP compared to HCFC-22, R-410A and R-407C. Energy efficiency is high and improved energy performance models are under development.
R-290		Residential / commercial acs	Commercially available though not as widely as R-410A or R-407C. Flammable refrigerant and has a very low GWP. Energy efficiency is high and improved energy performance models are under development.

Note: Other options such as Ammonia, HFOs, CO2 and blends are not considered as these products are not commercially available for procurement and testing for Kuwait conditions.

Given the main project objective, the technology options that would be considered for demonstration are HFC-32 and R-290. It is known that:

- a. Products suiting Kuwait requirements in terms of capacity and equipment technology are currently being produced in different countries in the region.
- b. Equipment using these technologies can be procured from international markets and installed for testing purposes in Kuwait conditions.
- c. Technical personnel in Kuwait involved in this project can be trained and equipped to use these equipment and measure performance of this equipment. This includes servicing of these equipment if necessary.

Project Background

The project was developed in close consultation among Kuwait Industrial and Scientific Research, technical experts in refrigeration and air-conditioning, UNDP staff and NOU. The project implementation structure was designed with expertise of KISR and with inputs from NOU and UNDP. Technical experts provided technical inputs relating to the type of equipment to be tested and performance assessment process for the different equipment proposed.

Project Description

As mentioned earlier, the project is designed for testing existing commercially available equipment using HFC-32 and R-290 based technologies. The equipment to be tested will include 8 TR equipment using R-32 and mini chillers with a capacity of 40 TR using R-290. The rationale for choosing the above equipment are:

- Usage characteristics and capacity of equipment typically used in Kuwait
- Availability of equipment in international and local markets using low GWP technologies
- Need for testing roof-top units or equivalent using R-290 based technology – this being helpful in safe operation of equipment
- Feasibility of maintenance and testing equipment using local technicians – this is also an important parameter while disseminating test results on utilisation of equipment.

More detailed specification of equipment would be finalized prior to bidding process. For managing this project, a Project Technical Steering Committee that includes technical experts and NOU will be constituted.

Under the proposed project, the following equipment are proposed to be bought.

Refrigerant	Capacity in TR	No. of units
HFC-32	10 TR	3 equipment or equivalent
R-290	40 TR (Mini Chiller)	1 equipment
Total	Not applicable	4 equipment

The equipment will be installed in the following sites:

- (a) One equipment in one Mosque
- (b) One commercial / public establishment close to sea shore
- (c) Two other locations including KISR and one in household location as found feasible

These locations have been chosen in consultation with technical experts, NOU and KISR. This would be representative of operational conditions prevailing in Kuwait and project boundary conditions defined for demonstration project in terms of scope and budget.

It must be noted that climate monitoring equipment is required for measuring local climate close to the location of installation of equipment. This has an impact on performance of air-conditioning equipment both cooling capacity and energy consumption levels.

The main technical parameters that would be monitored for the evaluation of the performance of HFC-32 package should facilitate two methods for cooling load estimation. Hence they include:

1. Outdoor-air dry-bulb temperature,
2. Dry-bulb temperature and Relative humidity of air stream at the upstream and downstream of evaporator or cooling coil,
3. Air flow rate through the evaporator,
4. Liquid-line temperature (downstream of the condenser),
5. Liquid line pressure (downstream of the condenser),
6. Suction line temperature (upstream of the compressor),
7. Suction line pressure (upstream of the compressor),
8. Refrigerant mass flow rate downstream of the condenser,
9. Power consumption of the whole unit.

On the other hand, the performance of the R-290 mini chiller will be monitored by means of the following parameters:

- a. Outdoor-air dry-bulb temperature,
- b. Chilled water temperature upstream of the chiller,
- c. Chilled water temperature downstream of the chiller,
- d. Chilled water flow rate upstream or downstream of the chiller, and
- e. Power consumption by the chiller.

The dynamic cooling load calculated by means of the above parameters will be compared to that presented by the chiller's built-in monitoring system.

Parameter	Instrumentation for measurement	No. of Units	Variable Index
Data Acquisition	OMB-DAQ-3000 Series: 1-MHz, 16-Bit USB Data Acquisition Modules	4	All ACs
	OMB-PDQ30: Analog input expansion module, adds 48SE/24DE channels to OMB-DAQ-3000 Series	3	All Packages
	OMB-CA-96A: OMB-DAQ-3000 Series to OMB-PDQ30 cable, 0.6 m	3	All Packages
	OMB-CA-179-5: USB cable, 5 m	4	All ACs
	OMB-CN-153-12: Spare terminal block	3	All Packages
	OMB-TR-2U: External power supply	4	All ACs
	OMB-PDQ10: DIN rail mounting adaptor for OMB-DAQ-3000	4	All ACs
Thermocouples	SA2C-K-120: Type K, 15 x 50 mm curved surface sensor, 3 m lead wire, stripped ends	14 (8+6)	4,6,b,c

Parameter	Instrumentation for measurement	No. of Units	Variable Index
Air Velocity (i.e. flow rate)	HHF-SD1: Data logging airflow meter with SD card-hot wire type	1	3
	SC-SD: Soft carrying case	1	3
	ADAPTER-SD: AC adaptor	1	3
	2GB-SD: Spare 2 GB SD memory card	1	3
Temperature/RH Transmitters	HX93BV0: Wall mount temperature / Relative Humidity Transmitter, 0 to 1 volt.	4	1,a
Temperature/RH Transmitters	HX93BV2-RP1: Remote Probe Temperature / Relative Humidity Transmitter, 0 to 10 volt output with 3 m (10') cable.	6	2
	PSR-24L-230: Regulated power supply, European plug, 230 Vac input, 24 Vdc output, 400 mA, stripped leads, CE	10	1,2,a
Pressure Transducers	PXM309-070G10V: Cable model, 70 bar range, gage pressure, 0 to 10 Vdc output	6	8,10
	PXMW-4: Sealing washer for G 1/4 thread, Stainless steel with FKM seal	12	5,7
Flow Meter	FDT-35: 18 to 830 LPM (5 to 220 GPM) range, 1-1/2' ANSI carbon steel/stainless steel pipe (check Pipe Size)	1	d
	FDT-31-C: 2 to 100 LPM (0.5 to 25 GPM) range, 1/2' copper pipe (check Pipe Size)	3	8
	FDT-30-PC CABLE: PC Communications Cable (recommended for first time buyers allows programming of the FDT-30 series with a PC)	1	8,d
	FDT-30-CABLE CLAMP: Water tight cable clamp	4	8,d
	FDT-HT-GREASE: Acoustic couplant for sensor mounting, max temperature 200°C (392°F) 56.7 g (2 oz) tube	1	8,d
Watt Transducer	PC5-114C: 3Ø3W AC WATT XDCR 0-600V/0-20A, 0-10Vdc, SELF PWR	4	9,e

Note: The monitoring equipment may need to be redesigned after the approval taking into consideration.

For each outdoor AC unit, a small air-conditioned cabin should be installed near to it in order to accommodate its associated monitoring system. Furthermore, a PC is required for each monitoring system in order to be linked with the data acquisition unit. The costs of the air-conditioned cabins and PCs should be considered. Similarly, the main duct section of each HFC-32 package unit should be equipped with a fire damper and its cost should be considered in the budget. The supplier of the HFC-32 package units should make provision for pressure sensors (downstream of the condenser and downstream of the evaporator).

For providing quality information on performance of the equipment, multi-channel data logger with transient unit measuring key parameters every 5 minutes) is proposed to be used. It is also proposed to have an on-line data monitoring system for this project.

To ensure that the product performance is tested in an effective manner, a training program will be conducted with the project technical team mainly from KISR. This training program would be conducted in close association with technical experts and equipment supplier technical personnel.

The project performance would be reviewed on a quarterly basis by PTSC which would be established for the project. The PTSC would report its findings to the higher Government authorities and UNDP.

Dissemination of project findings is an important element of this project. As a part of this project, the following information outreach activities are planned.

- Dissemination of findings of this project during the regional network meetings and international meetings (as found appropriate).
- Regional workshop on results of the demonstration project in terms of product performance and additional supportive interventions relating to policies and regulations for facilitating adoption of the technologies.

Project Costs and Financing

The total funding request from MLF amounts to US \$ 343,000. Details are provided in Annex-I. The project envisages co-financing from industry and technical experts which is in-kind (i.e., time and resources spent for the project).

Implementation

Project Monitoring Milestones

The project milestones and timelines from the date of receipt of funds is given in the table below. The estimated period over which the project would be completed is 30 months i.e., 10 quarters.

MILESTONE/MONTHS	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Start-up of project activities	X											
Procurement of equipment	X	X										
Installation and training		X	X									
Performance monitoring (over 2 seasons)			X	X	X	X	X	X	X	X	X	
Results information dissemination – network meetings								X	X	X	X	X
Sub regional workshop											X	X

Management

The project will be under the overall management and coordination of the National Ozone Unit, Government of Kuwait. UNDP will be the implementing agency for the project, which will provide international coordination and technical assistance as needed. KSIR would be the technical executing agency which would undertake installation monitoring, commissioning, technical performance monitoring of test equipment in this project and management of sub-regional technical workshop for this project. KSIR would work under direct supervision of NOU.

The project would employ Performance-based Payment (PBP) mechanism in its implementation. Under the PBP mechanism, the project activities would be assessed on achievement of different milestones and payments would be made against those milestones.

The procurement shall be organized fully in line with procedures followed by Government, so that the goods and services procured are high quality, most reasonable price and suitable for the purposes of the project activity. The detailed arrangement on procurement will be defined in the contract between Government of Kuwait and UNDP.

Verification

- 1) **Periodical Performance Verification.** Before each payment, NOU of Kuwait and UNDP will review the progress of activities based on documents and site visits/site visit reports. Upon satisfactory completion of the project.

- 2) **Technical Assessment.** Before the last installment of payment, NOU and UNDP will invite independent expert(s) to verify the project outcomes.

Impact

The successful implementation of this demonstration project will provide information on performance of an environmentally safe and cost-effective alternative for enabling replication of the technology in Kuwait in air-conditioning applications for the indicated capacity. This project would specifically show product performance results of HFC-32 and R-290 based technologies which are currently available in the market. Further, any additional information on technology performance with other low GWP technologies (e.g., HFOs, low GWP blends etc.) would be carefully reviewed by technical experts and disseminated to the national stakeholders during the workshops held during this project.

For each equipment using HFC-32 in place of HCFC-22, the direct GHG emission reduction impact on initial charge and recharge assumed at 2 times in the initial charge over the life of equipment is given in the table below.

Particulars	In. ch.	GWP	Tons CO2 eqv.
HCFC-22 for 10 TR	6 kg	1810	10.86
HFC-32 for 10 TR	4.2 kg	675	2.86
Savings (initial charge)			8.00
Savings (recharge equal to two times initial charge)			16.00
Total			24.00

For each equipment using R-290 in place of HCFC-22, the direct GHG emission reduction impact on initial charge and recharge assumed at 1.5 times in the initial charge over the life of equipment is given in the table below.

Particulars	Initial charge	GWP	Tons CO2 eqv.
HCFC-22 for 40 TR	24 kg	1810	43.44
R-290 for 40 TR	12 kg	0	0
Savings (initial charge)			43.44
Savings (recharge equal to 1.5 times initial charge)			65.16
Total			108.60

Depending upon the market adoption rate for the above products, the total savings of equivalent can be determined.

In addition to this, the project will yield the following additional benefits:

- Greater understanding of technical issues relating to HFC-32 and R-290 based air-conditioning equipment tested through the demonstration project.
- More hands-on knowledge on operations and maintenance of these equipment.
- Definition of appropriate policies and regulations for adoption of refrigerants with low and high flammability.
- Reduced demand for HCFC-22 in approx. 50,000 households (each household consumes about 50TR) that would be constructed in the next 8 years in Kuwait and strategic planning support to Government to adopt alternatives that are environmentally friendly in air-conditioning applications.

Annex 1
Project costs and funding request from MLF

Particulars	Unit cost (USD)	Units	Total
HFC-32 demonstration units – 10 TR capacity	6,000	3 units	18,000
R-290 demonstration unit – mini chiller (40 TR)	40,000	1 unit	40,000
Data logger along with monitoring equipment for 5 units	60,000	1 lot	60,000
Cabin for monitoring system near outdoor unit with air-conditioners	5,000	5 units	25,000
Training for staff for project management and monitoring	10,000	1 lot	10,000
Technical support for collating and analyzing test results (involving 1 Researchers, 1 Professionals, 1 Technicians and 1 Administrator)		1 Lot	100,000
Technical support from experts	500	80 units	40,000
Workshop – sub regional involving 15 countries	50,000	1 lot	50,000
Grand total			343,000
Funds requested from MFS			343,000
In-kind contribution from Government of Kuwait (in terms of time involvement of staff and local coordination)			25,000

Annex 2

Check on conformance with decision 72/40 on demonstration project

MFS criteria	Remarks relating to the project
In terms of a low-GWP alternative technology, concept or approach or its application and practice in an Article 5 country, representing a significant technological step forward;	Yes – the project promotes the technology options relating to R-32 and R-290 which are new to the market and have a potential to replace HCFC-22 and high GWP impact R-410A.
The technology, concept or approach had to be concretely described, linked to other activities in a country and have the potential to be replicated in the medium future in a significant amount of activities in the same sub-sector;	Replication potential exists in Kuwait and other countries with high Ambient temperature conditions. The project results will facilitate adoption of these technologies in a large area – both in middle east region and in other regions with similar conditions.
For conversion projects, an eligible company willing to undertake conversion of the manufacturing process to the new technology had been identified and had indicated whether it was in a position to cease using HCFCs after the conversion;	Not applicable – testing at site. Products are available and are proposed to be procured through international competitive bidding. From our understanding of the market, there would be interested companies in supplying these equipment.
The project proposals should prioritize the refrigeration and air-conditioning sector, not excluding other sectors;	Yes – air-conditioning sector
They should aim for a relatively short implementation period in order to maximize opportunities for the results to be utilized for activities funded by the Multilateral Fund as part of their stage II HCFC phase-out management plans (HPMPs);	Timeframe for implementation is driven by test results requirement. Testing is proposed over two summers and hence, a 36 month time-frame is proposed for the project
The project proposals should promote energy efficiency improvements, where relevant, and address other environmental impacts;	The project performance parameters include energy performance of the equipment. Given that the focus of the project is on performance of equipment, energy efficiency impact is directly measured and the results will be shared. Any ideas of improvement of energy efficiency will also be shared as an output from this project.