



**United Nations
Environment
Programme**

Distr.
GENERAL



UNEP/OzL.Pro/ExCom/96/31
27 April 2025

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-sixth Meeting
Montreal, 26–30 May 2025
Item 9(d) of the provisional agenda¹

PROJECT PROPOSAL: CUBA

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

Energy efficiency

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| <ul style="list-style-type: none"> • Pilot project to maintain and/or improve the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities): Introduction of energy-efficient refrigeration technology with low global-warming potential in chillers in the tourism sector | <p>UNDP</p> | <p>Individual
consideration</p> |
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¹ UNEP/OzL.Pro/ExCom/96/1

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT**Cuba****PROJECT TITLE****IMPLEMENTING AGENCY**

Pilot project to maintain and/or improve the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities): Introduction of energy-efficient refrigeration technology with low global-warming potential in chillers in the tourism sector	UNDP
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PROJECT OBJECTIVE

The pilot project aims to demonstrate the availability and feasibility of energy-efficient technologies with low global-warming potential (GWP) in the tourism sector by replacing HFC-based chillers in large hotel facilities with systems based on R-290 and HFO-1234ze. It highlights the benefits of potential greenhouse gas reductions while achieving cost and energy savings for end users due to the increased efficiency of new systems and lower maintenance and operating costs, consistent with the national HFC consumption reduction programme. The project's overall objective is to support Cuba's efforts to achieve gradual reductions in HFC consumption, with the additional nuance of replacing HFC-based systems with low-GWP, energy-efficient technologies.

NATIONAL COORDINATING AGENCY	Ozone Technical Office, Ministry of Science, Technology and the Environment
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LATEST ARTICLE 7 DATA (Annex F)	Year: 2024	339.16 mt	671,021 CO ₂ -eq tonnes
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Particulars	Non-investment activities
Project duration:	36 months
Initial amount requested:	US \$700,000
Final project costs:	US \$455,000
Requested grant:	US \$360,000
Implementing agency support costs:	US \$25,200
Total cost of project to Multilateral Fund:	US \$385,200
Co-financing:	US \$95,000
Energy-efficiency savings (kWh/year)	*578,200
Status of counterpart funding (Y/N):	Y
Project monitoring milestones included (Y/N):	Y
MEPS available for the relevant sector (Y/N):	**N

*Assuming at least 20 per cent savings in the energy consumption of two HFC-based chillers replaced with HC/HFO technology

**Current MEPS only cover residential air conditioners and domestic and commercial stand-alone refrigeration units.

SECRETARIAT'S RECOMMENDATION	Individual consideration
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PROJECT DESCRIPTION

Background

1. On behalf of the Government of Cuba, UNDP has submitted, in line with decision 91/65, a request for a pilot project to enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities), in the amount of US \$700,000, plus agency support cost of US \$49,000, as originally submitted.²

Pilot project on energy efficiency

2. Cuba ratified the Kigali Amendment on 20 June 2019. The licensing and quota system is in place, with HFC quotas allocated to importers as of 1 January 2024. Under stage I of the Kigali HFC implementation plan (KIP), approved at the 93rd meeting,³ Cuba committed to reducing its baseline HFC consumption by 10 per cent by 1 January 2029.

Policy, regulatory and institutional framework

3. The Ministry of Energy and Mines is responsible for proposing, directing and controlling the policies of the State and the Government in the energy sector. The National Office for the Control of Rational Use (ONURE), attached to the Ministry of Energy and Mines, is the institution in charge of regulating, controlling and inspecting the processes for the operation and efficient use of energy. ONURE issues instructions and recommendations related to energy efficiency in the hotel refrigeration and air-conditioning (RAC) sector. The project will be implemented by the Ozone Technical Office (OTOZ), in coordination with ONURE and the Ministry of Tourism. Cuba has minimum energy performance standards (MEPS) established for room air conditioners, domestic refrigerators, and small-capacity commercial refrigeration appliances.

HFC consumption and sector background

4. The HFC consumption baseline for Cuba has been established at 1,030,662 CO₂-equivalent (CO₂-eq) tonnes. Table 1 presents the country's total HFC consumption from 2020 to 2024.

Table 1. Consumption of HFCs in Cuba (2020–2024 Article 7 data)

	2020	2021	2022	2023	2024
mt	376.27	289.99	439.53	687.14	339.16
CO ₂ -eq tonnes	739,658	519,644	882,672	1,368,669	671,021

5. The 2021 decline in HFC consumption, largely attributed to the impact of the COVID-19 pandemic, was followed by a gradual increase over 2022 and 2023. In 2023, consumption surpassed the established HFC baseline because of economic recovery and consequent additional consumption in the servicing and installation of RAC equipment. In 2024, HFC consumption decreased again.

6. The demand for RAC systems in Cuba is growing across all subsectors, including tourism. HFC-134a remains the most used refrigerant in the tourism industry, followed by R-407C. The greatest demand for HFCs in the servicing sector comes from large air-conditioning (AC) systems with high refrigerant charges. The 2023 consumption of HFCs for chiller applications was 10 mt, which does not reflect actual demand, as many hotels that had closed during the COVID-19 pandemic did not yet reopen at that time.

² As per the letter of 11 February 2025 from the Ministry of Science, Technology and the Environment of Cuba to UNDP.

³ Decision 93/59

7. In terms of electricity consumption, the RAC sector accounts for approximately 20 per cent of total national use, with almost 13 per cent of total RAC sector consumption in tourism.

Project description and objective

8. The beneficiaries of the pilot project to replace five HFC-134a-based chillers with systems based on HFO-1234ze and R-290 represent a range of hotel sites, types and sizes, with different approaches and procedures, and equipped with chillers varying by capacity, placement (rooftop or ground level) and technology type (water or air). The project was designed to demonstrate the adoption of low-GWP technologies in such establishments and propose different options for energy efficiency while ensuring replicability across the tourism sector in Cuba. The four selected hotels are presented in table 2.

Table 2. Characteristics of hotels selected for the pilot project

	Hotel Nacional	Villa Cuba	Princesa del Mar	Meliá Las Dunas
Location	Havana	Varadero, Matanzas	Varadero, Matanzas	Cayo Santa María, Santa Clara
Hotel type	Vertical city building with 472 rooms	Horizontal structure with 365 rooms	Beach hotel with 630 rooms dispersed among the main building, bungalows, villas and common buildings	Beach hotel with 925 rooms dispersed among the main building, bungalows, and common buildings
AC structure and capacity (TR)	4 chillers of 125-220 TR	3 chillers of 140 TR	10 chillers of 80 TR 2 chillers of 65 TR	14 chillers of 65 TR
Proposed conversion	Replace 2 chillers (125 and 220 TR) with chillers based on HFO-1234ze, with magnetic levitation and water condensation	Replace 1 chiller with one based on R-290, with air condensation	Replace 1 chiller with one based on R-290, with air condensation	Replace 1 chiller with one based on R-290, with air condensation
Currently used refrigerant and charge	HFC-134a (177 kg) HFC-134a (245 kg)	HFC-134a (255 kg)	HFC-134a (169 kg)	HFC-134a (138 kg)
Energy savings (kWh/year)	228,200 382,200	196,000	130,200	106,400

9. For monitoring, the proposed project includes analysers for energy measurement and recording. The project will demonstrate the use of monitoring and evaluation techniques, both applied to existing systems to establish baseline performance, and integrated into the new equipment.

10. The energy savings achieved as a result of the project will promote interest in replicating the experience across the tourism sector in Cuba, which shows high demand for large AC systems. The results will be disseminated and promoted among the tourism sector stakeholders through activities held by institutions such as OTOZ, the Institute of Refrigeration and Air-Conditioning and ONURE, targeting refrigeration technicians, academic institutions, decision-makers, designers, investors, and the general public through technical materials, media promotion, and technological tours. The ONURE will regulate and promote energy-efficient technologies and handle the establishment of MEPS for chillers through relevant processes.

Proposed activities

11. As initially submitted, UNDP requested US \$700,000 for the procurement of five chillers and five devices to monitor their performance in real time, as detailed in tables 3 and 4.

Table 3. Cost breakdown of a project to replace five chillers at four hotels in Cuba

	Hotel Nacional		Villa Cuba	Princesa del Mar	Meliá las Dunas	Total
No. of chillers replaced	1	1	1	1	1	5
Chiller capacity (TR)	125	220	140	80	65	n/a
Replacement technology	HFO-1234ze		R-290	R-290	R-290	n/a
Chiller unit cost (US \$)	145,000	240,000	140,000	80,000	70,000	675,000
Performance measurement device unit cost (US \$)	5,000	5,000	5,000	5,000	5,000	25,000
Total (US \$)	150,000	245,000	145,000	85,000	75,000	700,000

12. As shown in table 4 below, the Government of Cuba would provide co-financing for energy consumption measurements to be taken before and during the project, as well as for the design and installation of new systems, equipment assembly and construction work on the installations, piping and materials, training of 20 maintenance technicians and managers on performance monitoring, data collection and maintenance of systems charged with flammable refrigerants, and the promotion of efficient technologies through dissemination of project results and distribution of technical materials on replacement technologies to achieve high replicability.

Table 4. Total project budget and financing sources breakdown, as submitted (US \$)

Component	Total	MLF funding	Co-funding
Procurement of chillers (5)	675,000	675,000	0
Procurement of performance measurement devices (5)	25,000	25,000	0
Energy consumption measurements	33,750	0	33,750
System design and installation	101,250	0	101,250
Equipment assembly and construction work	101,250	0	101,250
Training of technical and logistical personnel	67,500	0	67,500
Promotion of efficient replacement technologies	13,500	0	13,500
Total	1,017,250	700,000	317,250

Total cost of the pilot project

13. The project at a total cost of US \$700,000, plus agency support costs, as initially submitted, will be implemented between July 2025 and June 2028 and is expected to be completed within 36 months of approval. The Government of Cuba will provide co-funding of US \$317,250, as shown in table 4 above.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS**COMMENTS**

14. The Secretariat has reviewed the project proposal in light of the activities described under decisions 89/6 and 91/65 as well as those being implemented under stage I of the KIP.

Relation to HFC phase-down and the Kigali HFC implementation plan

15. On request for the clarification of links between the KIP and the pilot project, UNDP affirmed that the project would support the country's actions to comply with the 10 per cent reduction from the baseline

for the year 2029, focused on the RAC servicing sector. In particular, this project will be linked to component 1 of the KIP (Support for the development of an institutional context to promote the appropriate use of low-GWP substances in the framework of the implementation of the Kigali Amendment), which will help develop inter-agency coordination mechanisms to facilitate the implementation of the Kigali Amendment agreements, and dissemination and awareness raising at the national level on the use of low-GWP refrigerants. It is also linked to component 3 of the KIP (Development of activities to facilitate the reduction of demand for high-GWP HFCs), through training and awareness raising for end users to promote and adopt new low-GWP technologies. The project will complement the adoption of low-GWP technologies, the capacity of national entities to manage alternative technologies, and promote the establishment of standards and regulations to foster the adoption of new technologies.

16. In line with decision 91/65(b)(iv), confirmation from the Government of Cuba has been received.

Policy, regulatory and institutional framework and development of minimum energy performance standards

17. Upon enquiry, UNDP explained that, while there were currently no MEPS for commercial AC appliances in Cuba, the participation and involvement of ONURE in the development and implementation of this pilot project would help establish MEPS for chillers and other commercial RAC systems, and introduce a regulatory package for mandatory compliance with the MEPS in the tourism sector, which could then be applied to other sectors where similar, large RAC systems were being used.

18. On the replicability of project results, UNDP informed the Secretariat that, due to the involvement of ONURE, i.e., the institution that approves new investments in the country and is in charge of the implementation of the MEPS, the project results would inform the instructions and regulations of relevant environmental and energy policies aligned with the pilot project's objectives with regard to reducing CO₂ emissions through the use of efficient replacement technologies. The results would be further used by ONURE to promote investments in such energy-efficient technologies based on low-GWP refrigerants in the tourism sector and other relevant chiller applications. The performance of this technology would be publicised in the region through south-south cooperation and other relevant regional events.

Technical and cost-related issues

19. Upon inquiry about the availability and feasibility of proposed technologies (R-290 and HFO-1234ze), UNDP informed the Secretariat that hydrocarbon (HC) refrigerants, such as R-290 and R-600a, were widely used in Cuba for domestic and commercial refrigeration; and that with appropriate technical support on the safe operations and maintenance of HC-based chillers, the equipment could be operated in an efficient manner. While technology based on hydrofluoroolefins (HFOs) has not yet been used in Cuba, UNDP affirmed that the country's technical staff and engineers working in the RAC servicing sector were trained and capable of handling new technologies; with support from the technology providers, the equipment can be operated efficiently. UNDP added that refrigerant importers and distributors had the conditions and knowledge required to market HFOs if needed. On co-financing in the cost calculations, UNDP reported that it was considered as percentage of equipment cost.

20. The Secretariat asked about the rationale for the need to demonstrate two different technologies instead of one. UNDP explained that, to bring the latest chiller technologies to the country, it was essential to consider both HC and HFO options. According to UNDP, while HC-based chillers are suitable for smaller applications used in resorts due to their efficiency and environmental benefits, they may pose safety concerns for larger capacity installations. On the other hand, HFO chillers are ideal for bigger buildings due to their lower safety risks, but they come with higher costs. Therefore, it is not feasible to choose only one technology; a combination of HC for smaller applications and HFO for larger buildings ensures readiness for future changes without limitations. Since the demonstration of technology can be effectively done through selection of two sites (one for R-290 and one for HFO-1234ze), after discussions between the

Secretariat and UNDP, it was agreed that the number of sites would be reduced from five to two. UNDP further confirmed that the replaced equipment would be dismantled and disposed of.

21. The project's budget was adjusted based on the prioritization of chillers to be included. The most significant adjustment relates to the reduced number of demonstration replacements, from five chillers at four sites to two chillers at two sites. The Secretariat consulted with UNDP regarding co-financing, based on other similar projects. The total revised cost of the proposal is US \$455,000, as presented in table 5.

Table 5. Total project budget and financing sources breakdown, as agreed (US \$)

Component	Total	MLF funding	Co-funding
Procurement of chillers (2)	350,000	350,000	0
Procurement of performance measurement devices (2)	10,000	10,000	0
Energy consumption measurements	14,000	0	14,000
System design and installation	20,000	0	20,000
Equipment assembly and construction work	50,000	0	50,000
Training of technical and logistical personnel	7,000	0	7,000
Promotion of efficient replacement technologies	4,000	0	4,000
Total	455,000	360,000	95,000

Improvements in energy efficiency and preliminary estimates of electricity savings

22. UNDP estimated energy savings of at least 20 per cent (578,200 kWh) to be obtained from replacing two chillers with high-efficiency systems using low-GWP refrigerants. At a rate of US \$0.20 per kWh, the annual energy savings in electricity costs are estimated to amount to US \$115,640.

Sustainability of the pilot project and assessment of risks

23. A risk analysis was conducted to identify factors that could either affect the project or be generated by its implementation. The project faces several risks, including delays in chiller procurement due to varying hotel approval processes and government decisions on fund allocation. Safety issues and market availability of alternative technologies are also concerns. To mitigate these risks and minimize the impact of external factors, the project will plan procurement in advance, build awareness on the safe use of flammable refrigerants, ensure appropriate safety training, and closely monitor implementation modalities, the market availability of HC- and HFO-based products, and the budget for activities. Early discussions and clear information will secure commitment and ensure informed planning.

RECOMMENDATION

24. The Executive Committee may wish to consider approving the pilot project to maintain and/or enhance energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities): Introduction of energy-efficient refrigeration technology with low global-warming potential in chillers in the tourism sector, in the amount of US \$360,000, plus agency support costs of US \$25,200, for UNDP, noting:

- (a) That the Government of Cuba has committed to the conditions referred to in decision 91/65(b)(iv)b. to d.; and
- (b) That the project will be operationally completed no later than 30 June 2028, and a detailed project report will be submitted to the Executive Committee within six months of the date of completion of the project.