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EXECUTIVE COMMITTEE OF  
THE MULTILATERAL FUND FOR THE  
IMPLEMENTATION OF THE MONTREAL PROTOCOL  
Ninety-seventh Meeting  
Montreal, 1-5 December 2025  
Item 9(d) of the provisional agenda<sup>1</sup>

**PROJECT PROPOSAL: PANAMA**

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

Energy efficiency

- |                                                                                                                                                                                                                                                                                                                                                                                         |      |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------|
| <ul style="list-style-type: none"><li>• 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) and demonstration project for CO<sub>2</sub> transcritical cooling plant to replace R-410A-based chiller used for four cold rooms in the San Felipe Neri Market</li></ul> | UNDP | Individual consideration |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------|

<sup>1</sup> UNEP/OzL.Pro/ExCom/97/1

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

**PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT****Panama****PROJECT TITLE****BILATERAL/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) and demonstration project for transcritical CO <sub>2</sub> cooling plant to replace R-410A-based chiller used for four cold rooms in the San Felipe Neri Market | UNDP |
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**PROJECT OBJECTIVE**

The pilot project and demonstration have several aims, including developing an inter-institutional coordination strategy with government entities involved in energy efficiency; establishing a roadmap for the development of instruments that promote energy efficiency in the RAC sector; strengthening national capacities to maintain or improve energy efficiency during the maintenance of RAC equipment; implementing an energy efficiency strategy for RAC equipment used at the San Felipe Neri Market in Panama City; and demonstrating the energy efficiency of a transcritical CO<sub>2</sub> cooling plant with low-global-warming-potential technologies to replace the R-410A-based chiller currently used in four cold rooms in the San Felipe Neri Market, including the potential advantages of this technology in terms of reduced energy consumption, improved refrigerant performance, lower operating costs, and, if possible, reduced food loss.

|                                     |                                                |
|-------------------------------------|------------------------------------------------|
| <b>NATIONAL COORDINATING AGENCY</b> | National Ozone Unit, Ministry of Health Panama |
|-------------------------------------|------------------------------------------------|

|                                        |                   |                           |                                      |
|----------------------------------------|-------------------|---------------------------|--------------------------------------|
| <b>LATEST ARTICLE 7 DATA (Annex F)</b> | <b>Year:</b> 2024 | 845.82 metric tonnes (mt) | 1,892,969 CO <sub>2</sub> -eq tonnes |
|----------------------------------------|-------------------|---------------------------|--------------------------------------|

| Particular                                                                           | Non-investment activities            |
|--------------------------------------------------------------------------------------|--------------------------------------|
| HFC used by the servicing sector (2024 country programme data)                       | 856.33 mt                            |
|                                                                                      | 1,934,845 CO <sub>2</sub> -eq tonnes |
| Project duration (months):                                                           | 36                                   |
| Initial amount requested (US \$):                                                    | 365,000                              |
| Final project costs (US \$):                                                         | 737,000                              |
| Requested grant (US \$)                                                              | 342,000                              |
| Implementing agency support cost (US \$):                                            | 23,940                               |
| Total cost of project to Multilateral Fund (US \$):                                  | 365,940                              |
| Co-financing (US \$):                                                                | 395,000                              |
| Energy-efficiency savings (kWh/year):                                                | Ranges from 116,946 to 155,928       |
| Status of counterpart funding (Y/N):                                                 | Y                                    |
| Project monitoring milestones included (Y/N):                                        | Y                                    |
| Minimum energy performance standards (MEPS) available for the relevant sector (Y/N): | N                                    |

|                                     |                          |
|-------------------------------------|--------------------------|
| <b>SECRETARIAT'S RECOMMENDATION</b> | Individual consideration |
|-------------------------------------|--------------------------|

## PROJECT DESCRIPTION

### Background

1. On behalf of the Government of Panama, 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 \$365,000, plus agency support costs of US \$25,550, as originally submitted.<sup>2</sup>

### Energy-efficiency pilot project

2. Panama ratified the Kigali Amendment on 28 September 2018, and stage I of the Kigali HFC implementation plan (KIP) was approved at the 93<sup>rd</sup> meeting.<sup>3</sup> The country has committed to reducing HFC consumption by 10 per cent of the baseline by 2029. Activities in the approved KIP related to energy efficiency included updating the curricula of the engineering courses of the Panama Polytechnic to include alternative technologies and energy efficiency.

### Policy, regulatory and institutional framework

3. The Government of Panama enacted Law 69 in 2012 to incorporate energy efficiency into its national energy policy, followed by Executive Decree No. 398 in 2013, which established standards for energy-consuming equipment and materials. Air-conditioning (AC) was identified as a major contributor to electricity consumption in both the commercial and residential sectors (42 and 34 per cent respectively). Minimum energy performance standards (MEPS) in Panama were formally established starting in 2017. Five technical regulations and five technical standards were issued for energy-consuming equipment in the refrigeration and air-conditioning (RAC) sector for central, package or split AC units, room/window AC units, split on/off AC units, split inverter AC units, and household refrigerators/freezers. Panama also adopted ISO 5149:2014 standards for refrigeration system safety and environmental requirements.

4. In 2022, the National Strategy for Rational and Efficient Energy Use (ENUREE) was approved which targets a 17 per cent reduction in national electricity consumption by 2030. The strategy emphasizes technical standards, energy performance indices, and early replacement programmes for inefficient RAC equipment. The same resolution also created the Inter-institutional Commission for the Rational and Efficient Use of Energy (CIUREE) (comprised of eight government ministries, six government authorities, a national secretariat for science, two national banks, two universities, and the technical board of engineering and architecture) to support the implementation of ENUREE. In 2024, Panama adopted three Central American technical regulations with energy efficiency specifications under the Sistema de la Integración Centroamericana framework, covering inverter and fixed-speed split-type air conditioners, as well as household refrigerators and freezers. National standards will remain in effect until regional regulations are in place.

5. The Secretariat of Energy is responsible for the implementation of issues related to energy efficiency in the country and will be the entity responsible for developing the energy efficiency components of the national strategy. The national ozone unit (NOU), under the Ministry of Health (MINSA), will work in cooperation with CIUREE for regulations related to RAC equipment and for the implementation of the pilot project.

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<sup>2</sup> As per the letter of 28 August 2025 from the Ministry of Health of Panama to UNDP.

<sup>3</sup> Decision 93/72

### HFC consumption and sector background

6. The HFC consumption baseline for Panama has been established at the level of 2,543,386 CO<sub>2</sub>-equivalent (CO<sub>2</sub>-eq) tonnes. Table 1 presents HFC consumption in Panama.

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

| HFC consumption                                    | 2020      | 2021      | 2022      | 2023      | 2024      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| All HFCs and HFC-blends mt                         | 753.64    | 1,007.28  | 1,369.96  | 1,417.74  | 845.82    |
| All HFCs and HFC-blends CO <sub>2</sub> -eq tonnes | 1,474,052 | 1,978,141 | 2,708,376 | 2,733,914 | 1,892,969 |
| R-410A mt                                          | 160.19    | 240.62    | 375.67    | 326.71    | 294.69    |
| R-410A CO <sub>2</sub> -eq tonnes                  | 334,397   | 502,294   | 784,211   | 682,007   | 615,172   |

7. As reported at the 93<sup>rd</sup> meeting, there was a decrease in HFC consumption observed in 2020 due to the COVID-19 pandemic. From 2021-2023, the growth in HFC consumption reflected the increased demand for RAC appliances paired with HCFC phase-out and the accumulation of equipment servicing needs postponed during the pandemic. Fifty-nine per cent of the country's HFC consumption in terms of CO<sub>2</sub>-eq tonnes is attributed to the commercial refrigeration and commercial and industrial AC sectors. R-410A consumption, which is targeted in the demonstration project, has grown at a steeper pace than other HFCs and commercial AC makes up the majority of this consumption.

8. As reported in the country programme data for 2024, consumption use was 1,934,845 CO<sub>2</sub>-eq tonnes, which is 24 per cent below the HFC baseline.

### Project objectives

9. The pilot project aims to enhance energy efficiency in RAC applications in Panama, supporting both the KIP strategy and the national energy reduction strategy while aligning with ENUREE. Its objectives include:

- (a) Develop an inter-institutional coordination strategy among government and other stakeholders involved in energy efficiency and create a roadmap for instruments to promote energy efficiency in Panama's RAC sector. Additionally, the project seeks to strengthen national capacities for improving energy efficiency during RAC equipment maintenance; and
- (b) Demonstrate the energy efficiency of a transcritical CO<sub>2</sub> cooling plant with low-global-warming-potential (GWP) technologies to replace the R-410A-based chiller with a cooling capacity of 196kW currently used in four cold rooms in the San Felipe Neri Market in Panama City, including the potential advantages of this technology in terms of reduced energy consumption, improved refrigerant performance, lower operating costs, and, if possible, reduced food loss.

### *Beneficiary for the demonstration*

10. The San Felipe Neri Market has been selected to demonstrate best practices in energy use across various operations and to implement energy-efficient alternatives in cold room refrigeration showcasing energy-efficient technologies that use low-GWP refrigerants, as part of efforts to modernize the cold chain sector. Opened in 1951, it is one of Panama City's main municipal markets and has been identified as a strategic site for promoting sustainable urban food management, waste reduction, and improved energy efficiency. Approximately 8,500 people visit the market daily. It contains 139 commercial stalls across four sections: one for meat (beef, chicken, pork), one for fruits, vegetables, and groceries, one for restaurants and prepared food, and one for the lobby and administrative/operational offices. To preserve perishable

goods and ensure comfort for merchants, customers, and staff, the market relies on extensive RAC infrastructure. The pilot project will analyse energy and refrigerant use across market operations and develop an energy efficiency strategy, including best practices for refrigeration and AC. The project will compare the energy efficiency of the new system with the current one, disseminate results to end users, and build national capacity by training refrigeration technicians in the safe and efficient handling of transcritical CO<sub>2</sub> technology.

### Proposed activities

11. Activities with their cost breakdown (as initially submitted) are described below.

(a) *Institutional activities (US \$135,000):*

- (i) *Inter-institutional coordination (US \$25,000):* Formation of an inter-institutional committee; develop a workplan for the development of instruments that promote energy efficiency in the RAC sector; definition of criteria for energy efficiency for equipment larger than five tonnes of refrigeration; and dissemination of the committee's recommendations;
- (ii) *Strengthening the training of RAC maintenance technicians (US \$35,000):* Conduct a review of the curriculum at the National Institute for Human Development (INADEH) which is the training centre for RAC technicians and integration of section on energy efficiency (US \$10,000); procurement of a toolkit<sup>4</sup> to strengthen the INADEH laboratory (US \$20,000); and deliver three training workshops on the proper management of maintenance to enhance energy efficiency (US \$5,000);
- (iii) *Strategy for good practices in RAC equipment used in the San Felipe Neri Market (US \$75,000):* Identify the main users of RAC equipment in the market, establishing baseline of current equipment and systems, diagnose and evaluate energy use with projections over the next five years, identify opportunities to optimize energy use (US \$25,000); develop and deliver training for RAC users in the market on optimizing energy use and improve the energy efficacy of equipment and systems (US \$5,000), awareness campaign on project results and energy efficiency in RAC technologies to build national capacity for the safe and efficient handling, installation, operation of transcritical CO<sub>2</sub> systems (US \$35,000); and results dissemination activities (US \$10,000);

(b) *Demonstration of transcritical CO<sub>2</sub> refrigeration section of the cold rooms (US \$620,000):*

- (i) *Procure transcritical CO<sub>2</sub>-based cooling plant (US \$250,000):* Replace the existing R-410A-based central chiller system, which currently serves three cold rooms, a sorting/cutting room and two reception areas for beef and pork, with a transcritical CO<sub>2</sub> refrigeration plant.<sup>5</sup> The proposed system includes a cooling plant for medium and high temperature operation, suitable for indoor installation, with piston compressors and evaporation temperatures of -7°C and 8°C;
- (ii) *Procure evaporators (US \$115,000):* A set of evaporators would be installed for each area served, with specifications tailored to chamber size, temperature, and

<sup>4</sup> Energy performance monitoring equipment, manifold set, gauges, leak detector, manometer, support for didactic modules on telemetry for HVAC systems.

<sup>5</sup> Two cold rooms between 0°C to +4°C, one between +2°C to +4°C, and rooms for sorting and reception between +18°C to +20°C.

required cooling capacity; provision of technical assistance for the design, installation, and commissioning of the new system;

- (iii) *Installation, labour, detailed engineering, materials, freight, training, and commissioning (US \$240,000)*: Including inter alia high pressure piping material, security valves, electric installation wiring, electronic drivers, valves and transducers, power and control electric boards for each cold room and for the complete system, CO<sub>2</sub> detection systems, telemetry system, hardware and software plus license, labour, engineering project, refrigerant, commissioning and training of the system;
- (iv) *Project socialization with stakeholders (US \$10,000)*: Disseminating results among end users and technicians; and
- (v) *Energy consumption measurement and energy efficiency assessment (US \$5,000)*: Evaluating the energy performance of the CO<sub>2</sub> system compared to the current technology and collecting data to establish energy efficiency criteria for similar systems.

#### Total cost of the pilot project

12. The total project is expected to be completed in 36 months after approval, for a total cost of US \$755,000 of which US \$365,000 is requested from the Multilateral Fund and US \$390,000 (52 per cent of the project costs) is provided through co-financing by the beneficiary, as initially submitted. Table 2 provides a breakdown of the project costs for each of the activities and related components.

**Table 2. Total project budget and breakdown of financing sources, as submitted**

| Item                                                                                                      | Total<br>(US \$) | MLF<br>funding<br>(US \$) | Co-<br>financing*<br>(US \$) |
|-----------------------------------------------------------------------------------------------------------|------------------|---------------------------|------------------------------|
| <b>Component 1: Institutional component</b>                                                               |                  |                           |                              |
| Activity 1.1: Inter-institutional coordination activities                                                 | 25,000           | 25,000                    | 0                            |
| Activity 1.2: Strengthening the training of RAC maintenance technicians                                   | 35,000           | 35,000                    | 0                            |
| Activity 1.3: Strategy for good practices in RAC equipment used in the San Felipe Neri Market             | 75,000           | 40,000                    | 35,000                       |
| <b>Subtotal Component 1</b>                                                                               | <b>135,000</b>   | <b>100,000</b>            | <b>35,000</b>                |
| <b>Component 2: Demonstration of transcritical CO<sub>2</sub> refrigeration section of the cold rooms</b> |                  |                           |                              |
| Activity 2.1: Transcritical CO <sub>2</sub> -based cooling plant                                          | 250,000          | 250,000                   | 0                            |
| Activity 2.2: Evaporators                                                                                 | 115,000          | 0                         | 115,000                      |
| Activity 2.3: Installation, labour, detailed engineering, materials, freight, training, and commissioning | 240,000          | 0                         | 240,000                      |
| Activity 2.4: Project socialization with stakeholders                                                     | 10,000           | 10,000                    | 0                            |
| Activity 2.5: Energy consumption measurement and energy efficiency assessment                             | 5,000            | 5,000                     | 0                            |
| <b>Subtotal Component 2</b>                                                                               | <b>620,000</b>   | <b>265,000</b>            | <b>355,000</b>               |
| <b>GRAND TOTAL</b>                                                                                        | <b>755,000</b>   | <b>365,000</b>            | <b>390,000</b>               |

## SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

### COMMENTS

13. The Secretariat has reviewed the project proposal in light of the activities described under decisions 89/6, 91/65, and 95/87 as well as those being implemented under stage I of the KIP.

#### Eligibility under decisions 91/65, 95/87, and 89/6

14. This proposal has met the eligibility criteria under decision 95/87(d) since it is submitted as a servicing sector project to the 97<sup>th</sup> meeting. Proposed activities are in line with the eligibility criteria under decision 91/65(b)(i) since it is a project in the servicing sector and was not funded previously; 91/65(b)(iii) since the activity incentivizes the opportunity to avoid the continued growth in use of HFCs in similar markets; 91/65(b)(v) since the project is intended for replicability within the country; and since the Government of Panama commits to the conditions referred to in decision 91/65(b)(iv) b. to b(iv)e.

15. Proposed activities are in line with the eligibility criteria under decision 89/6(b)(i) since it includes activities for an end-user pilot project in the San Felipe Neri market to replace a R-410A central chiller system with a transcritical CO<sub>2</sub> refrigeration system; 89/6(b)(ii) since it includes a curriculum update for RAC technician training institutions to include energy efficiency; 89/6(b)(iii) since it includes the formation of an inter-institutional coordination committee to establish the mechanisms and work plan for the development of instruments that promote energy efficiency in the RAC sector in Panama; and 89/6(b)(v) since it includes an awareness campaign for the promotion of the energy-efficient RAC equipment operating with low- or zero-GWP refrigerants.

16. In line with decision 91/65(b)(iv), the Government of Panama has also confirmed that if Panama were to mobilize funding from sources other than the Multilateral Fund for energy-efficiency components when phasing down HFCs, the project would not result in the duplication of activities among those funded by the Multilateral Fund and those funded from other sources; the information on project progress, results and key learning would be made available, as appropriate; the date of completion of the project would be set as no more than 36 months after the date of approval by the Executive Committee and a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project.

17. UNDP confirmed that the Secretariat of Energy will be directly involved in the implementation of the pilot project in coordination with the NOU. Other stakeholders involved in the project includes Panama City Council which is responsible for the administration of the Comprehensive Network of Municipal Markets (RIMMU); INADEH, together with other national institutions, will be in charge of adapting its curriculum and developing training for technicians on the importance of energy efficiency in RAC systems and the safe and proper use of transcritical CO<sub>2</sub> technology; technology suppliers and installers will play a key role in the implementation process and will also be responsible for the initial training of technicians and end users of the equipment; and the Inter-institutional Technical Committee that will be established to facilitate the coordination and development of project tasks.

#### Relationship to HFC phase-down and the Kigali HFC implementation plan

18. The pilot project will be implemented in coordination with the activities under stage I of the KIP. Modernization of the cold chain of a highly visible popular market will help to strengthen the national energy efficiency strategy in a sector that is crucial for the country. The KIP's activities include the training of highly specialized technicians in technologies based on CO<sub>2</sub>. HFC refrigerants in the existing facilities to be replaced will also be recovered for subsequent reclamation or disposal as part of the activities under stage I of the KIP. The components and materials collected from the dismantled HFC-based equipment will

be separated and scrapped for other uses as much as possible, and the hazardous wastes will be disposed of as per the applicable regulations.

### Technical and cost-related issues

#### *Technology selection*

19. UNDP explained that CO<sub>2</sub>-based refrigeration systems have consistently outperformed HFC systems in terms of energy efficiency over the past eight years. They added that compared to R-404A or R-410A systems, the transcritical CO<sub>2</sub> direct expansion system offers an estimated energy efficiency advantage of over 15 per cent, including in warm climate regions. Safety was also a consideration in technology selection and category type A1 (non-flammable non-toxic) was necessary for a food market that receives many operators and thousands of customers every day and the transcritical CO<sub>2</sub> technology represents a long-term solution to HFC consumption.

#### *Selection of beneficiary*

20. UNDP explained that the San Felipe Market Administration is the beneficiary of the project which falls under the jurisdiction of the Municipality of Panama which has five other similar municipal markets within the RIMMU. Its role as a pilot project and replicable model within the RIMMU is central to scaling up these solutions in the capital's most socially and environmentally vulnerable districts. UNDP also explained that from the beginning of the process, meetings have been held with officials from the Market Administration, and agreements have been reached regarding the conversion and co-financing of the costs.

21. In order to understand and justify the intervention in the San Felipe Neri Market, UNDP and the NOU conducted technical visits to the San Felipe Neri Market and coordination meetings with market administrators, which allowed them to identify the characteristics of cold use in both the refrigeration and air conditioning areas. Based on the visits and intersectoral meetings, the cold storage section was selected as the most suitable for the pilot project, as it is the heart of the preservation of perishable foods, both meat and fresh vegetables.

#### *Type of equipment to be replaced and calculation of cost*

22. A representative cost calculation was made based on replacing the system with another R-410A chiller system. UNDP provided a quotation from an international company specializing in this type of installation. The comparative calculation was made against the R-410A/glycol chiller system versus the transcritical CO<sub>2</sub> cooling plant (cooling capacity for five areas) for a capacity of 196 kW and an installed capacity of 23 kg of R-410A, supplying cold rooms (0°C to 4°C), reception and sorting rooms (18°C to 20°C). On this basis, the project was designed to:

- (a) Install one cooling plant for medium and high temperature operation, suitable for indoor installation, with six piston compressors for medium temperature use, evaporation temperatures at -7°C /8°C and gas cooler outlet temperature of 38°C; and
- (b) Implement a system of evaporators for each of the four cold rooms to be served by the transcritical CO<sub>2</sub> refrigeration plant.

23. The Secretariat inquired about comparative costs and UNDP responded that replacing a conventional R-410A-based chiller with an energy-efficient transcritical CO<sub>2</sub>-based cooling plant would be 25 to 50 per cent more expensive since it would require additional costs to accommodate different evaporators, high-pressure tubing, enlisting higher skill level engineers and technicians, and safety changes to the facility (such as installing safety valves) for the use of CO<sub>2</sub>-based technology. Upon discussion of the cost elements, it was agreed to reduce the funds covered by the Multilateral Fund for component 2 of

the demonstration project from US \$265,000 to US \$242,000. A reduction of US \$13,000 was applied to the cost of the transcritical CO<sub>2</sub>-based cooling plant, noting that the beneficiary would co-finance the evaporators, the engineering, installation and related costs, as well as any additional cost on equipment, if required. In addition, UNDP noted that the transcritical CO<sub>2</sub>-based cooling plant would have a lifetime of 15 years because the equipment is more robust due to the higher pressures used, as opposed to 10 years for a R-410A-based chiller system because the R-410A system has more parts susceptible to wear and deteriorate over time such as pumps and heat exchangers. UNDP added that empirical data from Chile shows that CO<sub>2</sub> systems have a 30 to 50 per cent lower failure rate compared to HFC-based systems. This reduced failure rate translates into fewer breakdowns, lower maintenance needs, and ultimately, longer operational life.

24. In addition, US \$10,000 for the “project socialization with stakeholders” activity was removed on the understanding that the activity could be absorbed under the awareness campaign under Component 1. During discussions, UNDP increased the costs of Activity 1.1 “inter-institutional coordination” from US \$25,000 to US \$30,000 where the additional US \$5,000 would be co-financed to cover the costs of transportation, meetings, and materials.

25. The level of funding agreed upon will help ensure that the beneficiary market is motivated to participate and actively promote the adoption of this technology within other premises. It will also support the proper design and engineering of the project, leading to improved performance, fewer technical issues, and greater confidence in the technology's reliability and long-term viability.

### *Monitoring*

26. The funding recommended covers the energy measurement instruments needed for identification and implementation of measures to optimize energy use and improve the energy efficiency of equipment and systems as well as perform energy and food safety management via monitoring systems of the CO<sub>2</sub> solution by San Felipe Neri Market to collect and share information on energy consumption, performance comparisons, and savings comparisons to ensure proper reporting to the Executive Committee on the results of the project.

### Agreed cost of the pilot project

27. The agreed costs to implement the pilot project to demonstrate the performance and energy efficiency of transcritical CO<sub>2</sub> cooling plant in industrial applications in Panama amount to US \$737,000, including Multilateral Fund funding of US \$342,000 and co-funding of US \$395,000, as shown in table 3.

**Table 3. Total project budget and breakdown of financing sources, as agreed**

| Item                                                                                                      | Total<br>(US \$) | MLF<br>funding<br>(US \$) | Co-<br>funding<br>(US \$) |
|-----------------------------------------------------------------------------------------------------------|------------------|---------------------------|---------------------------|
| <b>Component 1: Institutional component</b>                                                               |                  |                           |                           |
| Activity 1.1: Inter-institutional coordination activities                                                 | 30,000           | 25,000                    | 5,000                     |
| Activity 1.2: Strengthening the training of RAC maintenance technicians                                   | 35,000           | 35,000                    | 0                         |
| Activity 1.3: Strategy for good practices in RAC equipment used in the San Felipe Neri Market             | 75,000           | 40,000                    | 35,000                    |
| <i>Subtotal for Component 1</i>                                                                           | <i>140,000</i>   | <i>100,000</i>            | <i>40,000</i>             |
| <b>Component 2: Demonstration of transcritical CO<sub>2</sub> refrigeration section of the cold rooms</b> |                  |                           |                           |
| Activity 2.1: Purchase of transcritical CO <sub>2</sub> -based cooling plant                              | 237,000          | 237,000                   | 0                         |
| Activity 2.2: Purchase of evaporators                                                                     | 115,000          | 0                         | 115,000                   |
| Activity 2.3: Installation, labour, detailed engineering, materials, freight, training, and commissioning | 240,000          | 0                         | 240,000                   |
| Activity 2.4: Energy consumption measurement and energy efficiency assessment                             | 5,000            | 5,000                     | 0                         |

| Item                            | Total<br>(US \$) | MLF<br>funding<br>(US \$) | Co-<br>funding<br>(US \$) |
|---------------------------------|------------------|---------------------------|---------------------------|
| <i>Subtotal for Component 2</i> | <i>597,000</i>   | <i>242,000</i>            | <i>355,000</i>            |
| <b>GRAND TOTAL</b>              | <b>737,000</b>   | <b>342,000</b>            | <b>395,000</b>            |

#### Energy-efficiency improvements and preliminary estimate of electricity savings

28. UNDP calculated on an indicative basis the potential energy savings of the demonstration project based on actual information from the identified beneficiary. In the San Felipe Neri Market, 37 per cent of the energy consumed is related to the cold rooms, which run 24 hours a day with a power input of 89 kW per hour. With an estimated average industrial electricity cost of US \$0.20 per kWh and a reduction in energy consumption between 15 and 20 per cent, the preliminary estimate is that the beneficiary would potentially achieve savings ranging from US \$1,965 to US \$2,620 per month from the current electricity bill which is approximately US \$13,099 per month for the cold rooms.

#### Sustainability, replicability and assessment of risks

29. UNDP explained that the market for transcritical CO<sub>2</sub> technology is growing, so from a technological perspective, it represents a long-term solution to HFC consumption. The immediate replicability of this project is expected to be high since the Panama City Council is responsible for the six municipal markets that make up the RIMMU and is committed to improving their environmental, social, and economic sustainability, which ensures the project's permanence and comprehensive sustainability in the future. The existence of the Market Network administered by the Mayor's Office facilitates the replicability of the project. Similarly, the creation of the project implementation committee with the participation of institutional actors will promote other energy efficiency promotion actions, including the identification of criteria for RAC systems similar to those to be implemented. In addition, as part of the project strategy, technical assistance will be provided to other markets in Panama City, as well as to supermarkets that may eventually apply this technology.

30. Regarding the implementation risks identified, lack of knowledge about transcritical CO<sub>2</sub> technology will be mitigated by training and assistance for all users, including institutions that train technicians in the maintenance of this type of equipment. To ensure the required commitment and capability of beneficiaries, the project has involved local authorities from the outset of the project to ensure the availability of resources. To mitigate risks associated with the management of high operating pressures in the transcritical CO<sub>2</sub> system, the project will include the training and education of designers, installers, and maintenance technicians to ensure safety in the new working conditions.

### **RECOMMENDATION**

31. The Executive Committee may wish to consider approving the 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) and demonstration project for the transcritical CO<sub>2</sub> cooling plant to replace the R-410A-based chiller used for four cold rooms in the San Felipe Neri Market in Panama, in the amount of US \$342,000, plus agency support costs of US \$23,940 for UNDP, noting:

- (a) That the Government of Panama has committed to the conditions referred to in decision 91/65(b)(iv)b. to b(iv)d.;
- (b) That the Government of Panama would define criteria for energy efficiency for equipment larger than five tonnes of refrigeration; and
- (c) That the project would be operationally completed no later than 31 December 2028 and a

detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project, including a detailed description of the activities undertaken to disseminate the results of the technology demonstration and to promote the adoption of the selected energy-efficient alternative technologies.

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