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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-fifth Meeting
Montreal, 4-8 December 2024
Item 9(d) of the provisional agenda¹

PROJECT PROPOSAL: HONDURAS

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 energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities): Introduction of a low-GWP energy-efficient refrigeration technology in processed food distribution centres | UNIDO | Individual consideration |
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¹ UNEP/OzL.Pro/ExCom/95/1

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT**Honduras****PROJECT TITLE****BILATERAL/IMPLEMENTING AGENCY**

Pilot project to maintain and/or improve energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities): Introduction of a low-GWP energy-efficient refrigeration technology in processed food distribution centres	UNIDO
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PROJECT OBJECTIVE

The pilot project aims to avoid the use of low-efficiency HFC-based refrigeration systems originally planned for a new distribution centre of Congelados de Honduras, by installing and commissioning a low-GWP energy-efficient (R-290/Glycol/CO ₂) commercial refrigeration system in the centre. The project proposal seeks to provide a model to demonstrate that the technology can be used safely and effectively by similar sectors in medium and large-sized enterprises in Article 5 countries, especially those with warmer climates. The project will reduce operating and energy consumption costs, minimize direct emissions by avoiding the use of HFCs, facilitate technology transfer to enterprises in the region, support the supply chain to allow the replication of the demonstrated refrigeration technology by local businesses, enhance the capacity of local partners to use the technology, provide an example of how to overcome barriers to adopting flammable and high-pressure systems, and prevent the use of a significant quantity of R-404A. The project will also provide the know-how, data, and tools to assist the commercial refrigeration sector and officials in implementing the existing regulations and developing policy.
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NATIONAL CO-ORDINATING AGENCY	National Ozone Unit, Ministry of Natural Resources and Environment
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LATEST ARTICLE 7 DATA (Annex F)	Year: 2023	975.79 metric tonnes (mt)	1,850,102 CO ₂ -eq tonnes
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Particular	Non-investment activities
Project duration (months):	36
Initial amount requested (US \$):	330,136
Final project costs (US \$):	625,136
Requested grant (US \$):	278,068
Implementing agency support cost (US \$):	19,465
Total cost of project to Multilateral Fund (US \$):	297,533
Co-financing (US \$):	357,068
Energy-efficiency savings (kWh/year)	28,800*
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**

*Assuming 10 per cent savings in energy consumption (kWh) of two R-404A-based chillers replaced by a single R-290/Glycol/CO₂ system.

**Current MEPS only cover domestic, commercial stand-alone units and residential air-conditioning (AC).

SECRETARIAT'S RECOMMENDATION	Individual consideration
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PROJECT DESCRIPTION

Background

1. On behalf of the Government of Honduras, UNIDO 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 \$330,136, plus agency support cost of US \$23,109, as originally submitted.²

Energy efficiency pilot project

Policy, regulatory and institutional framework

2. Honduras ratified the Kigali Amendment on 28 January 2019, with HFC quotas allocated to importers as of January 2024. Under stage I of the Kigali HFC implementation plan (KIP) approved at the 94th meeting, the country has committed to reducing HFC consumption by 15.5 per cent by 2029.

3. The Honduras energy sector accounts for over 40 per cent of national greenhouse gas (GHG) emissions. The country has established a policy and regulatory framework to advance energy efficiency, particularly within the refrigeration and air-conditioning (RAC) sector. Institutions playing a role in this effort include the Secretariat of Energy (SEN), the General Direction of Renewable Energy and Energy Efficiency (DGEREE), the Secretariat of Economic Development (SDE), the Honduran National Quality System (SNC), and the Secretariat of Natural Resources and Environment (SERNA). These institutions collaborate to enforce standards, promote sustainable practices, and fulfil national and international commitments to reduce energy consumption and GHG emissions.

4. The SEN is responsible for governing and guiding the development of the energy sector. The Rational and Efficient Use of Energy Law, enacted in April 2024, mandates the reduction of energy consumption across all sectors and the modernization of energy-consuming equipment. This law requires new energy-consuming devices to meet specific technical standards and be labelled with verified energy consumption information. Similarly, the Executive Decree No. PCM 34-2014 issued in response to national energy challenges, mandated energy-saving measures in state institutions, including a 10 per cent reduction in electricity budgets and the development of energy efficiency plans.

5. The Honduran Standardization Agency (OHN), composed of representatives of the private, public, academic and consumer sectors, coordinates *inter alia* the development and issuance of standards related to energy efficiency in the RAC sector, including two minimum energy performance standards (MEPS), so far voluntary, and focused on commercial and domestic RAC equipment.

HFC consumption and sector background

6. The HFC consumption baseline for Honduras has been established at the level of 1,460,674 CO₂ equivalent (CO₂-eq) tonnes. A portion of the national consumption of HCFC-22 has already been eliminated including conversions to HFC-based technologies. Table 1 presents HCFC and HFC consumption in Honduras.

² As per the letter of 3 September 2024 from the Ministry of Natural Resources and Environment of Honduras to UNIDO.

Table 1. Consumption of HCFCs and HFCs in Honduras (2019-2023)

Substances		2019	2020	2021	2022	2023
HCFCs	mt	180.08	134.46	61.21	127.47	111.92
HFCs	mt	701.9	485.44	520.99	644.20	975.79
	CO ₂ -eq tonnes	1,431,079	1,061,901	1,082,441	1,057,751	1,850,102

7. Total consumption of refrigerants (HCFC and HFC) in the period 2019 to 2023 increased by 23 per cent in mt despite the drop in consumption between 2020 and 2021 due to the effects of the COVID-19 pandemic on the country's economy. In 2023 the consumption of 1,850,102 CO₂-eq tonnes of HFCs was almost 27 per cent higher than the established baseline.

8. In 2021, the industry sector accounted for 33 per cent of electricity consumption in Honduras with between 30 and 40 per cent of that consumption related to the use of RAC systems. Ten per cent of industrial energy consumption is attributed to the food processing sector including a significant proportion for refrigeration. In 2022 the commercial and industrial refrigeration sectors in Honduras consumed about 110 mt of HFCs, mainly R-404A and R-507A. The food industry, particularly the dairy and frozen products subsector, uses R-404A and R-507A extensively, and the sector is characterized by high energy consumption and frequent refrigerant leaks.

9. In response to the HFC phase-down requirements and concerns about energy consumption and climate change, energy-efficient RAC systems for commercial and industrial applications based on low-GWP refrigerants, such as R-290 and CO₂, are being developed. Challenges that limit the adoption of such low-GWP options include limited knowledge and experience, equipment availability, along with the high initial conversion costs. Despite interest in the technologies, end users often choose familiar, lower-cost HFC systems. A pilot project introducing low-GWP technologies is proposed to demonstrate technical feasibility, financial impacts, energy and environmental benefits, and operational cost implications.

Enterprise background

10. Congelados de Honduras, founded in 1995, is a leading enterprise in the Honduran frozen food industry. It plays a significant role in domestic food security and facilitates exports to international markets. The distribution centres where it stores imported processed food products, including seafood, meats, fruits, and vegetables, are equipped with cold storage chambers that primarily use R-404A refrigerant. Congelados de Honduras plans to build a new 7,000 m³ distribution centre for frozen food in San Pedro Sula, the country's main transport, with the installation phase scheduled for the end of 2025.

Project objectives

11. The pilot project aims to avoid the use of low-efficiency HFC-based refrigeration systems originally planned for the new distribution centre of Congelados de Honduras, by installing and commissioning a low-GWP energy-efficient R-290/Glycol/CO₂ commercial refrigeration system in the centre.

12. The project proposal seeks to provide a model to demonstrate that R-290/Glycol/CO₂ combined refrigeration technologies can be used safely and effectively by similar sectors in medium and large-sized enterprises in Article 5 countries, especially those with warmer climates. The project will reduce operating and energy consumption costs, minimize direct emissions by avoiding the use of HFCs, facilitate technology transfer to enterprises in the region, support the supply chain to allow the replication of the demonstrated refrigeration technology by local businesses, enhance the capacity of local partners to use the technology, provide an example of how to overcome barriers to adopting flammable and high-pressure systems, and prevent the use of a significant quantity of R-404A.

Proposed activities

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

- (a) *Installation and commissioning of an operational refrigeration system based on R-290/Glycol/CO₂ technology in a food distribution centre:*
 - (i) Procurement of equipment including racks with one compressor for subcritical CO₂ (three units); an R-290 chiller with six compressors (capacity 43 TR³) including a glycol pumping system; three direct expansion evaporators for low-temperature defrosting (US \$300,136);
 - (ii) Equipment transportation and delivery, adapting physical infrastructure, assembly, installation and commissioning, contingencies (co-funding of US \$265,000);
- (b) *Technical assistance and training:*
 - (i) Training for staff and refrigeration technicians of Congelados de Honduras to handle the demonstration technology efficiently and safely, including regular updates on new technologies and safety protocols (US \$20,000); and
 - (ii) Engagement of a national expert to carry out an energy efficiency assessment including developing energy measures tailored to the new R-290/Glycol/CO₂ refrigeration system being installed and evaluating the energy efficiency of the installed system against conventional R-404A systems (US \$10,000).

Installation and commissioning of refrigeration systems

14. Based on the technical requirements of the new distribution centre, the project proposes the installation of refrigeration technology based on an R-290 chiller to supply glycol for the medium-temperature chamber or pre-chamber (15°C). This chiller will also serve as a condenser for the low-temperature system (-25°C) using CO₂ as the refrigerant. Through a heat exchanger, the R-290 chiller will maintain the CO₂ in a subcritical state, allowing it to behave like a conventional refrigerant by keeping the pressure controlled. Due to its thermodynamic properties, the R-290 chiller will consistently operate at maximum energy efficiency under extreme temperature conditions, with CO₂ effectively serving as the refrigerant for low-temperature applications.

Performance monitoring

15. A system to record and monitor the performance of the newly installed R-290/Glycol/CO₂ system against the R-404A baseline system will be implemented. Based on the cooling demand of the distribution centre, the technology supplier will establish a baseline model using the projected data for an R-404A system including key parameters such as energy consumption (kWh), refrigerant usage (kg of R-404A), cooling capacity, and operational hours. After the installation of the R-290/Glycol/CO₂ system the same key parameters will be measured over a six-month period to capture both seasonal variations and long-term performance data. UNIDO will oversee the monitoring process to ensure that data collection aligns with the project's objectives and to ensure the integrity of the results. Quarterly reports will be prepared to provide updates on the performance of the new system against the baseline model focusing on energy savings, refrigerant reductions, and overall system efficiency. A final report will be produced at the end of the monitoring period to document the project's success and lessons learned.

³ The unit of power ton of refrigeration (TR) is equivalent to 3.51685 kW.

Total cost of the pilot project

16. The project is expected to be completed in 36 months after approval, between January 2025 and December 2027 for a total cost of US \$330,136, as initially submitted. Congelados de Honduras would provide co-funding of US \$265,000. Tables 2 and 3 provide a breakdown of the project costs for each of the activities and related components.

Table 2. Total project budget and financing sources breakdown

Component	Item	Total (US \$)	MLF funding (US \$)	Co-funding (US \$)
Equipment and installation process	Equipment*	330,136	300,136	30,000
	Delivery of imported equipment	25,000		25,000
	Physical structure adaptation (Civil Works)	90,000		90,000
	Assembling, installation and commissioning	120,000		120,000
	Contingencies	30,000		30,000
<i>Subtotal equipment</i>		<i>595,136</i>	<i>300,136</i>	<i>295,000</i>
Technical assistance	Consultants and experts on R-290/Glycol/CO ₂ systems, technical assistance, training and assistance on complying with regulatory and certification processes	20,000	20,000	
	Assessment of energy gains in new technology	10,000	10,000	
<i>Subtotal technical assistance</i>		<i>30,000</i>	<i>30,000</i>	
GRAND TOTAL		625,136	330,136	295,000

*Including three racks with one compressor for subcritical CO₂, one R-290 (propane) chiller with six compressors, with a capacity of 3 TR, including a glycol pumping system, three direct expansion evaporators for low-temperature defrosting and two glycol evaporators for medium temperature.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS**COMMENTS**Eligibility under decision 91/65

17. In explaining how the project aligns with decision 91/65, specifically, under which of the eligible activities determined in that decision, UNIDO referred to sub-paragraph (b)(i)c. of the decision that prioritizes assembly and installation activities for large commercial and industrial refrigeration systems to enhance energy efficiency while phasing down HFCs. The project involves installing R-290/Glycol/CO₂ refrigeration systems to directly replace the HFC-based technology originally planned for installation in a distribution centre in 2025. This would avoid the use of 1,000 kg of R-404A representing the project's contribution to avoiding new HFC investments while enhancing energy efficiency. Furthermore, the project aligns with sub-paragraph (b)(iii) of decision 91/65 as it encourages energy efficiency activities that incentivize opportunities to avoid the continued growth of controlled substances. Specifically, the project focuses on preventing the introduction of new HFC-based systems through the promotion of low-GWP alternatives and promotion of long-term energy efficiency.

18. The Secretariat noted that the project does not propose to directly phase down existing HFCs and enhancement of energy efficiency in the process, but rather on establishing new cooling capacity with new use of energy. UNIDO emphasized that the project would avoid the installation of two R-404A-based conventional refrigeration systems, requiring 500 kg of R-404A per system as with the assistance the beneficiary enterprise has committed to using R-290 and CO₂ technology instead, not only preventing the installation of HFC systems but also avoiding future R-404A use for servicing.

19. UNIDO explained that the project would also avoid the high costs of a future conversion if an HFC system were installed. Replacing R-404A systems is highly challenging in Article 5 countries and many enterprises that had recently invested in HFC systems due to the HCFC-22 phase-down are not prepared to reinvest in new technologies before amortizing their current equipment. The pilot project would provide an opportunity to demonstrate the technical, energy efficiency, economic, and environmental benefits of R-290 and CO₂ technologies in a region where many enterprises are hesitant to adopt them due to recent HFC investments. The project would also serve as a benchmark proving that low-GWP technologies work even in high ambient temperatures, with a high replicability potential. Furthermore, once the new distribution centre is operational, it is likely to reduce the need for smaller, less efficient cold chain facilities, many of which rely on HFC-based systems. Centralizing refrigeration operations in a more efficient and sustainable facility will decrease the region's reliance on smaller systems, thereby indirectly reducing overall HFC emissions and boosting energy efficiency across the cold chain sector.

20. UNIDO informed that there are no other identified similar activities in Honduras apart from those outlined in the project proposal. In line with decision 91/65(b)(iv), the Government of Honduras confirmed that: if Honduras 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.

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

21. In line with decision 91/65(b)(iv)b., confirmation from the Government of Honduras has been received that the national ozone unit (NOU) will coordinate with relevant energy efficiency authorities and national standards bodies to facilitate the consideration of refrigerant transition when developing energy efficiency standards in the relevant sectors/applications.

22. The pilot project will be coordinated in alignment with activities under stage I of the KIP such as the training courses for large end users and instructors to promote the adoption of low-GWP technologies and improve energy efficiency in the sector. UNIDO also confirmed that if the technology is successful and the enterprise decides to replace some of their other RAC systems, the Government of Honduras would support the recovery of refrigerant from HFC equipment for its subsequent reclamation or disposal as part of the activities under stage I of the KIP and the project for preparation of a national inventories of banks of waste-controlled substances.

23. The results will be shared with users, system designers, and refrigeration technicians to encourage adoption of the technology in new applications and systems replacing HFCs. Information dissemination is planned as part of the commercial and industrial refrigeration sub-component under stage I of the KIP for Honduras, namely the planned regional workshop on the assessment of the installed inventory of condensing units and centralized systems and market penetration of low-GWP technologies.

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

24. UNIDO provided confirmation that the Ministry of Natural Resources and Environment, including the NOU, will provide overall coordination, the Ministry of Energy (SEN) will oversee energy efficiency policies and provide regulatory support, while the National Electric Energy Company (ENEE) will support the energy efficiency goals. In addition, as a result of the discussion on measures that could support energy efficiency in the application selected for the demonstration and more broadly in commercial refrigeration, the Government of Honduras confirmed that the NOU would work in collaboration with the Ministry of Energy and Honduran Standardization Organization (OHN) to develop draft MEPS for medium and low

temperature condenser units and centralized systems. The Secretariat and UNIDO agreed on including support for this activity under the project (US \$10,000).

25. Other private sector stakeholders participating in the project in addition to Congelados de Honduras, include refrigeration equipment manufacturers and suppliers to provide equipment, components, technology, and technical support; local assembly and installation companies to adapt and implement the low-GWP refrigeration technologies; and the Energy Service Companies (ESCOs) to conduct energy audits, assess efficiency gains, and propose improvements.

Technical and cost-related issues

26. The Secretariat and UNIDO discussed the potential duplication of activities listed in this project and the additional activities included in the country's HCFC phase-out management plan (HPMP) to maintain or enhance energy efficiency (decision 89/6). UNIDO explained that the focus of each project was different. The additional activities under the HPMP were focused on developing national capacities to strengthen the energy efficiency of stand-alone RAC appliances where MEPS have been developed and would need to be updated, whereas the present project is focused on the promotion of actions to improve energy efficiency in the commercial and industrial refrigeration sectors.

27. In relation to the cost of equipment, plant adaptation and installation, the Secretariat noted that the estimated costs for the entire system is similar to costs quoted for large refrigeration systems in previous projects; although it is noted that these costs could vary based on the specific conditions of the premises, cooling capacity and variety of features required. The Secretariat and UNIDO discussed the cost of a similar system using R-404A as the enterprise would invest of that system in the absence of the project; it was estimated that the additional cost of investing in the new technology would be close to 40 per cent above the investment on the HFC technology, noting the cost of individual items needed (i.e., three racks with one compressor for subcritical CO₂, one R-290 (propane) chiller with six compressors, including a glycol pumping system, three direct expansion evaporators for low-temperature defrosting and two glycol evaporators for medium temperature), plant adaptations and assembly, installation and commissioning of the system; taking into consideration also additional costs associated to being the first installation of a specific technology and the fact that some of the components are not yet fully available in the local market. The original proposal requested US \$300,136 for these items, which corresponds to 50 per cent of the costs of these items. UNIDO agreed to reduce the request for these items to 40 per cent of the costs, or US \$238,068.

28. Given the relevance of supporting the development of draft MEPS for medium and low temperature condenser units and centralized systems, as discussed in paragraph 24, it was agreed to include support for this activity for US \$10,000.

Agreed cost of the pilot project

29. A total Multilateral Fund cost of US \$278,068 was agreed to implement the pilot project for maintaining and enhancing the energy efficiency of replacement technologies and equipment for processed food distribution centres in Honduras. The adjusted activities include the reduction in the cost for equipment and their agreed costs are presented in table 4.

Table 4. Multilateral funding and co-funding agreed

Component	Item	Cost (US \$)	MLF funding agreed (US \$)	Co-funding agreed (US \$)
Equipment and Reconversion Process	Equipment	330,136	165,068	165,068
	Delivery of imported equipment.	25,000		25,000
	Physical structure adaptation (civil works)	90,000	*20,000	70,000
	Assembling, installation and commissioning	120,000	53,000	67,000

Component	Item	Cost (US \$)	MLF funding agreed (US \$)	Co-funding agreed (US \$)
	Contingencies	30,000	0	30,000
<i>Subtotal equipment</i>		<i>595,136</i>	<i>238,068</i>	<i>357,068</i>
Technical Assistance	Consultants and Experts	20,000	20,000	0
	Assessment of energy gains in new technology	10,000	10,000	0
	Development of draft proposal for MEPS for condensing units and centralized systems	10,000	10,000	0
<i>Subtotal technical assistance</i>		<i>40,000</i>	<i>40,000</i>	<i>0</i>
GRAND TOTAL		635,136	278,068	357,068

*Only safety items related to installation of flammable refrigerants, while civil works are covered by the beneficiary

Energy efficiency improvements and preliminary estimate of electricity savings

30. UNIDO assumed an energy savings of 10 per cent (28,800 kWh) by installing the alternative system rather than the two conventional R-404A systems (144,000 kWh each) based on industry technology supplier data and one similar project that demonstrates the energy efficiency of R-290 and CO₂ in commercial refrigeration systems. With an estimated annual energy savings of 10 per cent and an average industrial electricity cost of US \$0.30 per kWh in the country, it is preliminarily estimated that the beneficiary would potentially achieve an annual savings of US \$8,640 on the electricity bill.

Sustainability, replicability and assessment of risks

31. UNIDO explained that based on the results of the pilot project in Congelados de Honduras, the enterprise will consider the gradual conversion of its refrigeration systems to R-290/Glycol/CO₂ technology. The enterprise has seven distribution centres using R-404A-based systems and another four warehouses currently using HCFC-22-based refrigeration. The enterprise also has plans for consolidating its 18 distribution centres into eight centres. If the project is successful, the enterprise would consider the demonstrated technology for these consolidated centres.

32. Beyond the replicability at the enterprise, as the project intends to demonstrate the performance of R-290 and CO₂ technology under high temperature conditions, it has a potential replicability in other Article 5 countries in the region and globally that are not familiar with these technologies in large applications. As the project will implement R-290 and CO₂ technologies for both medium and low-temperature applications, results can be adaptable to the refrigeration needs in various commercial and industrial applications, such as supermarkets, food processing plants, cold storage warehouses, and pharmaceutical cold chain.

33. The project risk assessment identified potential risks across five key categories: technical, financial, operational, environmental, and reputational. Each risk is evaluated based on its impact and likelihood. Most of them are assessed as low and medium impact and none of them with high likelihood. Among risks with high impact are equipment failures, safety hazards, cost overruns, funding shortfalls, maintenance challenges, refrigerant leaks, and failure to meet objectives. Furthermore, corresponding mitigation actions were designed to ensure that the project is adequately prepared to manage uncertainties and potential setbacks, enhancing the likelihood of successful project execution.

RECOMMENDATION

34. 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 a low-GWP energy-efficient refrigeration technology in

processed food distribution centres in Honduras, in the amount of US \$278,068, plus agency support costs of US \$19,465 for UNIDO, noting:

- (a) That the Government of Honduras has committed to the conditions referred to in decision 91/65(b)(iv)b. to b(iv)d.; and
 - (b) That the project would be operationally completed no later than 31 December 2027 and a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project.
-