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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-eighth Meeting
Montreal, 22–26 June 2026
Item 8(d) of the provisional agenda[1]

PROJECT PROPOSAL: INDONESIA

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

Energy efficiency

• Project to enhance energy efficiency in the manufacturing of domestic refrigerators and freezers, beverage coolers, and ice cream display freezers in the context of HFC phase-down	UNDP	Individual consideration

* Revised to include annex I on the methodology to calculate additional component costs.

[1] UNEP/OzL.Pro/ExCom/98/1

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

Indonesia

PROJECT TITLE	AGENCY
Project to enhance energy efficiency in the manufacturing of domestic refrigerators and freezers, beverage coolers, and ice cream display freezers in the context of HFC phase-down	UNDP

PROJECT OBJECTIVE
This project aims to improve the energy efficiency of domestic refrigerators and freezers, beverage coolers, and ice cream display freezers manufactured by five enterprises that are converting from HFC-134a to R-600a under the project approved in decision 96/41 and enable the market uptake of energy-efficient, low-GWP equipment.

NATIONAL COORDINATING AGENCY	National ozone unit and Ministry of Environment

ARTICLE 7 DATA (Annex F)	Year: 2024	10,256.91 mt	13,855,733 CO_2-eq tonnes

PROJECT DETAILS		
HFC consumption in the domestic refrigeration manufacturing sector in 2025 (country programme data)	mt	266.83
	CO_2-eq tonnes	381,567
Project duration	months	36
Grant amount requested from the Multilateral Fund	US $	10,352,498
Grant amount agreed	US $	4,499,739
Project support costs for UNDP	US $	314,982
Total cost of project to Multilateral Fund	US $	4,814,721
Energy-efficiency savings to be achieved through the project	kWh/year	409,529,362
Counterpart funding		Yes
Project monitoring milestones included		Yes
Minimum energy performance standards available for the relevant sector (Y/N)		Yes*

* Mandatory minimum energy performance standards have been established for domestic refrigeration equipment and room air conditioners; domestic freezers and display ice cream freezers will be developed by 31 December 2031.

SECRETARIAT'S RECOMMENDATION	Individual consideration

PROJECT DESCRIPTION

1. On behalf of the Government of Indonesia, the World Bank as the designated implementing agency has submitted, in line with decision 94/60, a request for a project to enhance energy efficiency in the domestic refrigeration manufacturing sector in the context of HFC phase-down, in the amount of US $10,352,498, plus agency support costs of US $724,675, as originally submitted.[2] At the completion of the project review process, the Government informed the Secretariat that it wished to change the designated implementing agency from the World Bank to UNDP. Hence, the initial submission and most of the discussions took place with the World Bank.

Background

2. Indonesia ratified the Kigali Amendment on 14 December 2022. Activities to be incorporated into the first tranche of stage I of the Kigali HFC implementation plan (KIP) were approved at the 96th meeting,[3] noting that the Government of Indonesia would submit its proposal for the full stage I of its KIP by 2027. Approved activities in the manufacturing sector cover the phase-out of 251.23 metric tonnes (mt) of HFC-134a through the conversion of five domestic refrigeration manufacturers to R-600a. The country also committed to ban inter alia the manufacture and import of HFC-based domestic refrigerators and stand-alone commercial refrigeration equipment by 1 January 2029 (decision 96/41(c)(i) and (ii)).

Policy, regulatory and institutional framework

3. The Directorate General of Climate Change Control, operating under the Ministry of Environment, hosts the national ozone unit (NOU), which is responsible for the implementation of Montreal Protocol-related measures and programmes.

4. The Indonesian Ministry of Energy and Mineral Resources (MEMR) is the primary regulatory body to formulate and implement policies for energy conservation and management. Through its Directorate General for New, Renewable Energy, and Energy Conservation (DGNREEC), the MEMR plays a central role in developing, implementing, and enforcing minimum energy performance standards (MEPS) and energy-efficiency labelling to promote the market uptake of energy-efficient products.

Minimum energy performance standards

5. The MEMR has established mandatory MEPS for domestic refrigeration equipment and room air conditioners. The refrigeration equipment covered by MEPS includes domestic refrigerators, refrigerated display cabinets, and beverage coolers with a capacity below 300 liters, whereas domestic and display freezers are not yet covered, as shown in table 1. The majority of domestic refrigeration equipment manufactured in Indonesia have low star ratings, indicating low energy efficiency.

Table 1. MEPS coverage of domestic refrigeration equipment in Indonesia

Covered by MEPS	Not covered by MEPS
• Domestic refrigerators: Upright, single door, and double door • Refrigerated display cabinets: Beverage coolers • Water dispensers	• Domestic freezers: Chest freezers and upright freezers • Refrigerated display cabinets: Ice cream freezers

6. Environmental chambers are used to test refrigeration equipment, including their energy performance, measuring compartment temperature, refrigerant flow, energy consumption, cooling capacity, ascending speed of load temperature, and voltage, current, power, and power factor. Six chambers are

[2] As per the letter of 13 March 2026 from the Ministry of Environment of Indonesia to the World Bank.
[3] Decision 96/41

situated at independent testing laboratories in West Java and Central Java and are available for use by all enterprises for a fee; three are currently used for testing beverage coolers and three for domestic refrigerators. Some enterprises also have their own testing chambers.

7. Manufacturers and importers must test their products in laboratories accredited for energy-performance testing, register compliant products with the MEMR, and report compliance through a designated reporting system. They are also required to submit a quarterly report specifying the brand, type/model, capacity/power, and quantity of appliances produced or imported. Products must display an official energy-efficiency label. The regulation specifies that non-compliance may result in sanctions, including withdrawal from the market. Enforcement is supported by regular market surveillance, accredited certification bodies, and testing laboratories under national standards.

HFC consumption and sector background

8. The HFC consumption baseline for Indonesia has been established at 23,370,721 CO_2-equivalent (CO_2-eq) tonnes. As reported in the country programme (CP) data, total HFC use in 2025 was 15,196,193 CO_2-eq tonnes, which is 35 per cent below the baseline. Table 2 presents HFC consumption in the country in 2021–2025.

Table 2. 2021–2025 HFC consumption in Indonesia (Article 7 data)

Substances	2021	2022	2023	2024	2025*
Metric tonnes (mt)					
All HFCs	6,364.18	15,678.74	3,502.63	10,256.91	10,836.33
HFC-134a	2,903.41	6,784.68	2,197.06	3,330.84	3,314.09
CO_2-eq tonnes					
All HFCs	9,707,351	30,402,883	1,535,575	13,855,733	15,196,193
HFC-134a	4,151,876	9,702,092	3,141,796	4,763,101	4,739,148

* CP data

9. As further discussed in document UNEP/OzL.Pro/ExCom/96/42, consumption after 2021 fluctuated considerably, notably reflected in an unusually high and then low consumption in 2022 and 2023, respectively, attributed to a rebound from depressed economic activity due to the COVID-19 pandemic, stockpiling, and re-exportation of certain refrigerants with high global-warming potential (GWP) in 2023 and 2024. Consumption of HFC-134a followed a similar though subdued trend, with the increase in 2022 and decrease in 2023 smaller than for overall consumption. HFC-134a consumption for refrigeration manufacturing decreased 33 per cent between 2024 and 2025, while consumption for air-conditioning (AC) and other manufacturing more than tripled; consumption to service refrigeration and air-conditioning (RAC) equipment decreased by 7 per cent.

Domestic refrigeration manufacturing

10. The domestic refrigeration subsector accounts for most manufacturing activity in the country's refrigeration industry, with both HFC-134a and R-600a used. Equipment is manufactured for both domestic and foreign markets and includes domestic refrigerators, chest freezers, display freezers, and water dispensers, with most refrigerators and freezers manufactured for the domestic market having a capacity under 200 litres and charged with HFC-134a, and larger (280-600 litre capacity), mostly imported, units predominantly based on R-600a.

11. There are eight manufacturers of domestic refrigeration equipment in Indonesia.[4] Of the five enterprises participating in the project (Maspion, Sanken, Sharp, Polytron, and Fujisei), one (Sharp) is multinational, with 7.6 per cent local ownership; Polytron is the only one with exports, exporting about 1 per cent of its products. Haier, LG and Panasonic account for less than 15 per cent of the market share of domestic refrigerators and freezers, beverage coolers and ice cream display freezers in the country. Imports account for approximately 15 per cent of domestic refrigerators in the market, 80 per cent of domestic freezers, and 60 per cent beverage coolers and display freezers.

Project overview

Project objectives and coordination with stage I of the Kigali HFC implementation plan

12. The project will be implemented in conjunction with the implementation plan for the first tranche of stage I of the KIP approved through decision 96/41, which includes inter alia the conversion from HFC-134a to R-600a of five enterprises manufacturing domestic refrigeration equipment by 1 January 2029. Proposed costs of the project are complementary to those approved under decision 96/41 and cover research, upgraded product components, and policy development, aiming to improve the energy efficiency of the products manufactured by these enterprises and enable the market uptake of energy-efficient, low-GWP equipment.

Proposed activities as submitted

Additional capital costs and additional component costs

13. Proposed activities at the five domestic refrigeration manufacturers (Maspion, Sanken, Sharp, Polytron, and Fujisei) include:

(a) Additional capital costs: Prototype development, certifications, third-party testing and technology transfer; and

(b) Additional component costs: The inclusion of upgraded or additional components. Components for domestic refrigerators and freezers will include energy-efficient compressors and heat exchangers as well as vacuum insulation panels added to the refrigerator bodies and doors; display ice cream freezers will be equipped with upgraded compressors, as well as compressor fans for the larger models; and beverage coolers will be equipped with more efficient compressors.

14. The calculation for eligible additional component costs was based on the methodology described in document UNEP/OzL.Pro/ExCom/94/61. The total funding requested amounts to US $8,946,148 for the five domestic refrigeration manufacturers, as shown in table 3.

Table 3. Summary of additional capital and component costs by enterprise, as submitted

Item	Maspion	Sanken	Sharp	Polytron	Fujisei	Total
Equipment manufactured						
Manufacturing (units/year)*	35,359	73,698	1,569,333	590,835	104,488	2,373,713
Number of models manufactured	16	18	16	15	18	83
Number of models to be upgraded	13	11	15	11	16	66
Improvement in energy efficiency (%)	34	33	40	20	38	32
Additional capital costs (US $)						

[4] Fujisei Plastik Seitek (Fujisei), Haier Electrical Appliances Indonesia (Haier), Hartono Istana Teknologi (Polytron), LG Electronics Indonesia (LG), Maspion Elektronik (Maspion), Panasonic Manufacturing Indonesia (Panasonic), Sanken Argadwija (Sanken), and Sharp Electronics Indonesia (Sharp).

Item	Maspion	Sanken	Sharp	Polytron	Fujisei	Total
Prototype development	7,100	7,350	11,595	5,200	7,000	38,245
Certification and testing	29,250	24,750	33,750	24,750	36,000	148,500
Technology transfer	25,000	25,000	25,000	25,000	25,000	125,000
Additional component costs (US $)						
Component costs	439,885	361,171	16,905,488	9,098,355	2,140,278	28,945,177
Eligible component costs	300,985	361,171	14,631,427	6,236,041	689,216	22,218,840
Total	**362,335**	**418,271**	**1,117,335**[**]	**6,290,991**	**757,216**	**8,946,148**

* Average for 2022–2024.
* Reflects 7.6 per cent Article 5 ownership.

Testing laboratories

15. Technical assistance activities include the establishment of four environmental chambers (two for domestic refrigerators and freezers and two for beverage coolers) installed at the MEMR offices in Jakarta and East Java to support product development and certification. Costs are proposed as a lump sum, covering prefabricated concrete slab, polyurethane foam insulation, lighting, AC unit, air blower, evaporator, condensing unit, humidifier, power and measuring cabinet, power supply panel, thermo-couple panel, data and humidity control set, data acquisition system, explosion-proof sensors, ventilation system, software, electricity control system, transportation, calibration, and training, in the amount of US $1,000,000 (US $250,000 per chamber).

Policy development

16. Policy development activities are proposed to strengthen energy-efficiency regulations: MEPS for domestic refrigeration equipment will be increased by 10 to 20 per cent, and the standards will be further expanded to include domestic freezers, which operate at lower temperatures and currently fall outside the existing MEPS framework, and ice cream display freezers. The following activities and costs are proposed in the amount of US $406,350 for policy development:

(a) Expansion of MEPS to include domestic and ice cream display freezers:

(i) Market survey and analysis for the revision of MEPS to include domestic and ice cream display freezers (US $50,000);

(ii) Development of MEPS, guidelines, and testing protocols for domestic and ice cream display freezers (US $50,000);

(iii) Review of MEPS in other countries in the region to assess achievable targets (US $30,000);

(b) Random product testing by the MEMR to enable the enforcement of MEPS and gain a better understanding of the energy performance of refrigeration products available in the market; includes 66 models at US $2,250 per test (US $148,500); and

(c) Contingency (US $127,850).

Cost of the project as submitted

17. At a total cost of US $10,352,498, plus agency support costs, as initially submitted, the project is expected to be completed within 36 months of approval, between July 2026 and June 2029. Table 4 presents the proposed activities and costs for the project.

Table 4. Summary of activities and costs of the project, as submitted (US $)

Project component	Cost
Additional capital costs	246,746
Additional component costs	8,699,402
Testing laboratories	1,000,000
Policy development	278,500
Contingency	127,850
Total	**10,352,498**

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

18. The project includes enterprise- and policy-level activities, both of which are required for successful implementation. The Secretariat reviewed enterprise-level activities in line with decision 94/60 and policy-level activities under decision 91/65.

Eligibility under decision 94/60

19. While the Government has implemented MEPS for domestic refrigerators and beverage coolers, it has not yet developed them for domestic and ice cream display freezers. In line with decision 94/60(b)(i), no incentive would be available for equipment for which no MEPS exist. However, the Secretariat noted that over 92 per cent of the agreed additional component costs was for domestic refrigerators and beverage coolers (i.e., equipment with established MEPS) and that less than 8 per cent would be for equipment that was not yet covered by MEPS. In other words, for a relatively small additional investment, the energy efficiency of two additional types of equipment (i.e., domestic and ice cream display freezers) would be substantially improved. Accordingly, on an exceptional basis and further to discussions between the Secretariat and the World Bank, it was agreed to include the equipment for which MEPS had not yet been implemented in the project, noting that the Government committed to developing and implementing MEPS for domestic and ice cream display freezers to at least the levels achieved by models qualifying for an incentive under the project by 31 December 2031.

Eligibility under decision 91/65

20. This proposal meets the eligibility criteria of decision 95/87(d), since it was submitted prior to the 100th meeting and, in line with decision 91/65(b)(iv), the Government of Indonesia has confirmed that the NOU will coordinate with the MEMR to facilitate the consideration of refrigerant transition when developing energy-efficiency standards, noting that the current national testing capacity is limited to equipment with a capacity of up to 300 liters; that if Indonesia were to mobilize funding from sources other than the Multilateral Fund for energy-efficiency 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; that the information on project progress, results and key learning would be made available, as appropriate; that the date of completion of the project would be set at no more than 36 months after the date of approval by the Executive Committee; and that a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project.

Coordination with the activities planned under decision 96/41

21. The implementation of activities planned under decision 96/41 had not yet been initiated, allowing for the conversion of enterprises from HFC-134a to R-600a to be aligned with the timeline of the present project.

Institutional, policy and regulatory framework

Minimum energy performance standards

22. The Secretariat noted that while targeted energy efficiency for most domestic refrigerator and freezer models was below 1.6 kWh/year/litre, for some models it was substantially higher.[5] The continued manufacturing of models that were relatively energy-inefficient would limit the country's ability to upgrade its MEPS in the future. Accordingly, it was agreed to set the maximum target energy efficiency of domestic refrigerators and freezers to 2.0 kWh/year/litre.

23. In line with paragraph 38 of document UNEP/OzL.Pro/ExCom/94/61, the Government confirmed its commitment to periodically upgrade MEPS regulations, labelling programmes and awareness and outreach activities to ensure that the target energy-efficiency levels for the equipment under the project were publicized among different stakeholders. The Government also committed to take steps to implement MEPS to ensure that the manufacturing, import and sale of domestic refrigerators and beverage coolers would at least achieve the target energy-efficiency performance levels that qualified for an incentive under the project, at the latest within three years from the date of completion of the project.

Technical and cost-related issues

24. The Secretariat noted that while the enterprises had agreed to improve the energy efficiency of the majority of manufactured equipment, they had decided not to include five models in the project. The World Bank confirmed that the enterprises committed to ensuring that, if they continued manufacturing those models, the models would at least meet the MEPS established by the country. In addition, not all models manufactured by the enterprises participating in the project qualify for an incentive, with the qualifying volume varying between 56 and 99 per cent. As the qualifying percentage was above 50 per cent for all enterprises, in line with decision 97/32, the additional conditions specified in subparagraphs 40(a) and (b) of document UNEP/OzL.Pro/ExCom/97/26 were not necessary.

Test conditions to determine additional component costs

25. In line with decision 94/60, additional component costs for refrigeration equipment are determined based on the difference between the baseline and target energy consumption relative to a nominal low and high energy-efficient model, the former of which is based on the United for Efficiency (U4E) model regulations.[6] For example, a model moving from low to high energy efficiency is eligible for higher additional component costs than a model that is already energy-efficient and further improves its efficiency. In other words, the level of eligible additional component costs depends on the energy efficiency where a model starts (i.e., the baseline) and ends (i.e., the target) relative to the U4E model regulations. In order to compare the baseline and target energy performance relative to the U4E model regulations, consistent testing conditions need to be used. For example, equipment that is tested at a higher temperature than the conditions specified in the U4E model regulations would appear less energy-efficient, which could result in an erroneous reduction of the eligible additional component costs.

26. Energy consumption of equipment sold in Indonesia is tested at 32 °C and 65 per cent relative humidity (RH). Some models were retested at 25 °C and 50 per cent RH and the World Bank used the results to determine their baseline energy performance; however, for models that were not retested, the World Bank assumed a 30 per cent reduction in energy consumption at the country's test conditions.

[5] In contrast to AC equipment where the higher the coefficient of performance the better the energy performance, lower energy consumption (kWh/year/litre) in refrigeration equipment translates to better energy performance.

[6] The 2019 U4E model regulations for domestic refrigerators can be accessed here, and the 2021 U4E model regulations for commercial refrigeration equipment are available here.

27. The test conditions for beverage coolers specified in the U4E model regulations are 25 °C and 60 per cent RH. Accordingly, baseline energy consumption of beverage coolers should be adjusted to account for the reduction in energy efficiency given the test conditions in Indonesia. The Secretariat used the data provided for models that were retested at 25 °C and 50 per cent RH. For models that were not retested, the Secretariat consulted with industry experts and based the adjustment on the values provided in Sánchez et al. (2017),[7] resulting in a decrease in energy consumption of 11 per cent at 25 °C relative to 32 °C. Similarly, the U4E model regulations specify test conditions of 30 °C and 55 per cent RH for ice cream display freezers, resulting in a decrease in energy consumption of 2.75 per cent at 30 °C relative to 32 °C. While equipment that is tested at a higher RH will appear less energy efficient that when tested at a lower RH, the Secretariat was unable to adjust to the different RH used in the Indonesia test conditions than that specified in the U4E model regulations (i.e., 60 and 55 per cent, respectively).

28. The U4E model regulations for domestic refrigerators and freezers allow for testing at 20 °C, 24 °C, and 32 °C. Accordingly, the Secretariat used the baseline energy performance measured at Indonesia's test condition (i.e., 32 °C) to determine the additional component costs for domestic refrigerators and freezers.

Calculation of additional costs under decision 94/60

29. In addition to adjustments to baseline energy performance described in paragraphs 25 to 28 above, and to the maximum target energy efficiency of domestic refrigerators and freezers specified in paragraph 22, the following corrections and adjustments to the calculation of additional component costs were made: using the adjusted rather than the nominal volume of the model for domestic refrigerators and freezers and the equivalent volume for ice cream display freezers when determining the reference annual energy consumption; correcting the target energy efficiency for a small number of models (see table 5 below); using the high energy-efficiency index for beverage coolers as specified in the U4E model regulations; and basing the manufacturing volume on average manufacturing output by the enterprises in 2023–2025, in line with decision 97/33. Four domestic refrigerator models did not meet the current MEPS; as the target energy efficiency was insufficient to enable those models to qualify for an incentive, the adjustment to additional component costs used in a precedent project[8] was not used. Accordingly, and as further summarized in table 6 below, the additional component costs were agreed at a total of US $29,517,338, resulting in a total incentive of US $4,122,993 based on one third of the additional component costs, in line with decision 94/60, and adjusting for non-Article 5 ownership of one enterprise.

Table 5. Agreed improvement in energy efficiency of equipment manufactured (per cent)

Item	Maspion	Sanken	Sharp	Polytron	Fujisei	Total
As submitted	34	33	40	20	38	32
Agreed	36	38	40	20	39	33

30. The additional capital costs were agreed as submitted. After adjusting for non-Article 5 ownership of one enterprise, the total agreed additional capital costs were US $246,746, resulting in a total funding of US $4,369,739 for the five enterprises.

Table 6. Agreed additional capital and component costs, incentive and funding (US $)

	Additional capital cost	Additional component cost		Incentive		Total funding	
		As submitted	Agreed	As submitted	Agreed	As submitted	Agreed
Maspion	61,350	300,985	265,892	300,985	88,631	362,335	149,981
Sanken	57,100	361,171	429,295	361,171	143,098	418,271	200,198
Sharp*	5,346*	14,631,427	18,558,829	1,111,988*	470,157*	1,117,335*	475,503*

[7] D. Sánchez, R. Cabello, R. Llopis, I. Arauzo, J. Catalán-Gil, E. Torrella, "Energy performance evaluation of R-1234yf, R-1234ze(E), R-600a, R-290 and R-152a as low-GWP R-134a alternatives," International Journal of Refrigeration, Volume 74, 2017, pages 269-282, ISSN 0140-7007, https://doi.org/10.1016/j.ijrefrig.2016.09.020.

[8] UNEP/OzL.Pro/ExCom/97/49

	Additional capital cost	Additional component cost		Incentive		Total funding	
		As submitted	Agreed	As submitted	Agreed	As submitted	Agreed
Polytron	54,950	6,236,041	9,297,648	6,236,041	3,099,216	6,290,991	3,154,166
Fujisei	68,000	689,216	965,673	689,216	321,891	757,216	389,891
Total	**246,746**	**22,218,840**	**29,517,337**	**8,699,402**	**4,122,993**	**8,946,148**	**4,369,739**

[*] Reflects 7.6 per cent Article 5 ownership

Testing laboratories

31. The Secretariat noted with appreciation the proposal to strengthen the country's testing capacity by establishing four new test chambers. The establishment of such testing capacity would enable the enterprises to more easily test the energy efficiency of their equipment, and the MEMR to test the equipment imported into the country and manufactured by Haier, LG and Panasonic. Moreover, the proposed new testing capacity would enable the testing of equipment with a capacity greater than 300 litres, which in turn would allow the broadening of MEPS to also include such larger equipment.

32. However, the Secretariat noted that other testing capacity existed in the country, since refrigeration equipment subject to MEPS required an energy-saving certificate from a product certification body before it could be placed on the market. The certification body must be accredited for energy-performance testing[9] by the National Accreditation Committee. There are a number of accredited laboratories in Indonesia, including Government-related PT Sucofindo and private facilities such as PT Polytron, PT Qualis, TÜV Rheinland, and others. In addition, the Secretariat recalled that the project approved under decision 96/41 included funding to upgrade the test chambers at PT Polytron[10] and at Sharp.

33. While noting that the proposed new test chambers would be established where such testing facilities did not presently exist, and that local enterprises paid a testing fee to obtain an energy-savings certificate, the Secretariat was not clear of the business model for the four new test chambers given the existing testing capacity in the country, and whether the existing private facilities might wish to expand their infrastructure to capture the additional business associated with the project. Moreover, decision 97/88(b) allows the inclusion of proposals to strengthen or upgrade the existing energy-efficiency testing centres in manufacturing countries in the context of proposals submitted under decision 94/60, but the establishment of new testing centres was not included in the decision. Accordingly, and given the limited time to finalize the review process, it was agreed to remove the proposal to establish four new test chambers from the project.

Policy development

34. Funding for policy development was agreed at US $130,000 based on the following:

(a) While recognizing the critical importance of the random testing of products in the market by the MEMR to enforce MEPS, consistent with the project submitted under decision 94/60 in Thailand,[11] the Secretariat considers that such testing should be financed by the Government concerned to ensure the sustainable enforcement of its MEPS. Accordingly, it was agreed to remove the proposed assistance from the project; and

(b) Technical assistance costs were agreed at US $130,000 to expand the range of products covered by the country's MEPS, including an assessment of energy performance of equipment with capacity higher than 300 litres; development of MEPS for domestic freezers and ice cream display freezers, including a market survey and analysis and development of guidelines and testing protocols; and a review of MEPS in other countries in the region for

[9] SNI 8557-1:2018 IEC 62552-1:2015 & SNI 8557-3:2018 IEC 62552-3:2015

[10] Funding was provided to upgrade two of PT Polytron's nine test chambers, with the enterprise co-financing upgrades to three chambers to enable the testing of R-600a models.

[11] Document UNEP/OzL.Pro/ExCom/98/51

equipment with a capacity higher than 300 litres and for domestic and ice cream display freezers. The latter activity will also help the country assess feasible targets for future upgrades of its MEPS, noting that most manufactures in the region source their components locally.

Cost of the project as agreed

35. The agreed cost of the project to enhance energy efficiency in the manufacturing of domestic refrigerators and freezers, beverage coolers, and ice cream display freezers in the context of HFC phase-down in Indonesia amounts to US $4,499,739, as shown in table 7.

Table 7. Summary of activities and costs of the project, as agreed

Project component	Proposed costs (US $)	
	As submitted	As agreed
Additional capital costs	246,746	246,746
Additional component incentive	8,699,402	4,122,993
Testing laboratories	1,000,000	0
Policy development	278,500	130,000
Contingency	127,850	0
Total	**10,352,498**	**4,499,739**

Energy-efficiency enhancements and estimated savings

36. Based on the baseline energy consumption per model, target energy efficiency, and number of units of each model manufactured by the enterprises, [12] the cumulative energy savings amount to 409.53 million kWh/year, resulting in a cost-effectiveness of US $0.01 kWh/year for the project. At an average electricity price of US $0.1/kWh in Indonesia, the project would result in annual savings to Indonesian consumers of approximately US $40.95 million.

Change of implementing agency

37. At the completion of the project review process, the Government informed the Secretariat that it wished to change the implementing agency from the World Bank to UNDP.

Sustainability, replicability and assessment of risks

38. The domestic refrigerator market in Indonesia is dominated by equipment manufactured by the enterprises participating in the project, while the market for domestic and ice cream display freezers and beverage coolers is dominated by imported equipment. While the implementation and continued upgrading of MEPS will help the overall sustainability of the project, appropriate MEPS are of critical importance for the equipment dominated by imports. In addition, the timely development and implementation of MEPS for equipment currently not subject to MEPS (i.e., freezers and display ice cream freezers) is essential to ensure a level playing field for the beneficiary enterprises versus importers of such equipment and non-participating enterprises.

39. The Secretariat consulted with UNDP on measures that would be implemented to ensure the sustainability of the project. Based on those consultations, it was agreed that:

(a) In line with paragraph 37 of document UNEP/OzL.Pro/ExCom/94/61, for those models eligible for an incentive under the project, the beneficiary enterprises commit to manufacturing equipment with at least the target energy efficiency performance after project

[12] Information considered confidential.

completion. In addition, the enterprises commit to make best efforts to continue to improve the energy efficiency of the products they manufacture beyond the project duration at their own cost. The performance of equipment manufactured by the enterprises will be monitored for a period of two years from the date of completion of the project by the NOU and UNDP;

(b) Noting that the enterprises chose not to include several models they manufactured in the project, the enterprises committed to ensuring that if they continue manufacturing those models, at their own cost, those models will at least meet the MEPS established by the country;

(c) The Government committed to developing and implementing MEPS for domestic and ice cream display freezers to at least the levels achieved by models qualifying for an incentive under the project by 31 December 2031 to ensure a level playing field between beneficiary enterprises and non-participating enterprises and importers;

(d) The Government committed to exploring the expansion of the range of products covered under its existing MEPS (e.g., equipment with volume greater than 300 litres);

(e) In line with paragraph 38 of document UNEP/OzL.Pro/ExCom/94/61, the Government committed to periodically upgrading its MEPS, labelling programmes and awareness and outreach activities to ensure that the target energy-efficiency levels for the equipment under the project were publicized among stakeholders. The Government also committed to take steps to implement MEPS to ensure that the manufacturing, import and sale of domestic refrigerators and beverage coolers would at least achieve the target energy-efficiency performance levels that qualified for an incentive under the project at the latest within three years from the date of completion of the project;

(f) The Government further committed to implementing awareness and outreach initiatives to publicize activities undertaken under the project, including implementation timelines for MEPS for domestic refrigerators and freezers, beverage coolers, and ice cream display freezers, coordination with stakeholders, and alignment with other national or regional programmes promoting energy-efficient RAC equipment while following its normal inter-agency consultation and coordination process;

(g) On behalf of the Government, UNDP will submit a detailed report on the implementation of the project, including the additional capital and component costs incurred for the models covered in the project, the energy-efficiency gains accrued and challenges faced; and

(h) UNDP would ensure that the project was operationally completed no later than 36 months from the date of approval and return the funding associated with the additional component costs and any other remaining balances that had not already been disbursed if the project is not completed by 36 months.

RECOMMENDATION

40. The Executive Committee may wish to consider approving the project to enhance energy efficiency in the domestic refrigeration manufacturing sector in the context of HFC phase-down in Indonesia, in the amount of US $4,499,739, plus agency support costs of US $314,982, for UNDP, noting:

(a) The commitment of the Government of Indonesia to:

(i) Develop and implement minimum energy performance standards (MEPS) for freezers and display ice cream freezers to at least the levels achieved by models qualifying for an incentive under the project by 31 December 2031;

(ii) Explore the expansion of the range of products covered under its existing MEPS (e.g., equipment with volume greater than 300 litres);

(iii) In line with paragraph 38 of document UNEP/OzL.Pro/ExCom/94/61, periodically upgrade the MEPS, labelling programmes and awareness and outreach activities to ensure that the targeted energy-efficiency levels for the equipment under the project are publicized among stakeholders;

(iv) Take steps to implement MEPS to ensure that the manufacturing, import and sale of domestic refrigerators and beverage coolers would at least achieve the target energy-efficiency performance levels that qualified for an incentive under the project at the latest within three years from the date of completion of the project;

(v) Implement awareness and outreach initiatives to publicize activities undertaken under the project, including implementation timelines for MEPS for domestic refrigerators and freezers, beverage coolers, and ice cream display freezers, coordination with stakeholders, and alignment with other national or regional programmes promoting energy-efficient RAC equipment while following its normal inter-agency consultation and coordination process;

(vi) Ensure that the beneficiary enterprises:

a. In line with paragraph 37 of document UNEP/OzL.Pro/ExCom/94/61, for those models eligible for an incentive under the project, manufacture equipment with at least the target energy efficiency performance after project completion. In addition, the enterprises commit to make best efforts to continue to improve energy efficiency of the products they manufacture beyond the project duration at their own cost;

b. If they continue manufacturing models not included in the project, that those models will at least meet the MEPS established by the country;

(b) That if the Government does not comply with the conditions specified in the present decision, the Executive Committee would take this into account when considering future projects that are not related to compliance submitted by Indonesia;

(c) That, of the agreed funding, US $4,369,739, plus agency support costs of US $305,882, for UNDP, will be allocated to the funding window approved under decision 94/60 and that US $130,000, plus agency support costs of US $9,100, for UNDP, will be allocated to the funding window approved under decision 91/65; and

(d) That the project will be operationally completed no later than 30 June 2029, and a detailed project report will be submitted to the Executive Committee within six months of the date of completion of the project.

Annex I

METHODOLOGY TO CALCULATE ADDITIONAL COMPONENT COSTS

1. The World Bank provided detailed information for each model manufactured by the six enterprises, including (by model) the number of units sold between 2022 and 2025; volume (in litres); refrigerant and refrigerant charge; and the baseline and target energy consumption (in kWh/year). The information provided by the World Bank is considered confidential and is available upon request by Executive Committee members on the understanding that the information will not be shared and will only be used to evaluate the project.

Domestic refrigerators

2. The Secretariat used the information provided by the World Bank to calculate the eligible additional component costs following the methodology described in table 2 of document UNEP/OzL.Pro/ExCom/94/61. The present annex provides further explanation of the methodology and presents the calculations for two models of domestic refrigerators; for reasons of confidentiality, no information is provided on which enterprise manufactured the models, nor the quantity of each model manufactured.

3. Table 2 of document UNEP/OzL.Pro/ExCom/94/61 specifies three levels (E-low, E-medium, and E-high) based on which additional component cost per unit is provided (US $0/unit, US $15/unit, and US $20/unit, respectively), noting that eligible additional component cost per unit is determined by the baseline and target energy performance of the model, as described in paragraph 28 and the associated graphs of that document.

4. Because the test conditions of 32°C used in Indonesia differ from those upon which table 2 in document UNEP/OzL.Pro/ExCom/94/61 is based (i.e., 25°C), and because table 2 is based on a normative distribution of domestic refrigerator models of different capacity,[1] the levels of E-low, E-medium, and E-high were determined based on the U4E E-low, E-medium, and E-high at 32°C. In particular:

(a) For each model, based on the methodology explained in the U4E model regulations for domestic refrigerators (2019),[2] the value for the maximum annual energy consumption (AEC_{Max}) was calculated at a standard test temperature of 32°C according to the following equations:

(i) Refrigerators: $AEC_{Max} = 0.220 \times AV + 137$, where AV = adjusted volume (litre) as explained in U4E's model regulations;

(ii) Refrigerator-freezers: $AEC_{Max} = 0.288 \times AV + 210$;

(iii) Freezers: $AEC_{Max} = 0.268 \times AV + 247$;

(b) AEC_{Max}, which is in kWh/yr, was adjusted to kWh/yr/litre using the equipment adjusted volume in litres; and

[1] The table is based on a beneficiary that manufactures a normative distribution of domestic refrigerator models whose kWh/year/litre has an equivalent MEPS of 1.109, which is equivalent to the low energy efficiency level for that equipment under the United for Efficiency (U4E) assessment. The normative distribution of models, which was based on technical subject specialist expert inputs on an overall market average for models of domestic refrigerators, assumes 10 per cent and 5 per cent of domestic refrigerator models have a capacity of 100 litres and 400 litres, respectively; and the remaining 85 per cent of models will be in the 200-300 litre range.

[2] https://united4efficiency.org/wp-content/uploads/2019/11/U4E_Refrigerators_Model-Regulation_20191029.pdf

(c) This maximum value was used as E-low, with E-medium and E-high adjusted to 0.8 and 0.59 respectively of that value. For example, for a domestic refrigerator-freezer tested at 32°C with an adjusted volume of 330 litres, AEC_{Max} is equal to 305.04 kWh/year, resulting in E-low, E-medium, and E-high of 0.924, 0.739, and 0.545 kWh/yr/litre. This methodology was applied to each of the models of domestic refrigerators manufactured.

5. Two illustrative examples for the calculation of the eligible additional component incentive for domestic refrigerators are given in table 1.

Table 1. Examples for the calculation of the eligible additional component incentive for domestic refrigerator-freezers

Particulars	Unit	Reference	Model A	Model B
Adjusted volume	Litre	-	250	150
Baseline energy consumption	kWh/year/litre	A1	1.610	1.971
Target energy consumption	kWh/year/litre	A2	0.966	1.478
E-low	kWh/year/litre	A3	1.068	1.628
E-medium	kWh/year/litre	A4	0.854	1.302
E-high	kWh/year/litre	A5	0.630	0.961
Additional component cost	US $/unit	A*	7.16	6.91
Eligible additional component incentive	US $/unit	B=A*/3	2.39	2.30

Note: A* = 15 x (A3-A2)/(A3-A4)

Beverage coolers

6. The analogous methodology explained above for domestic refrigerators was used for beverage coolers, noting that the reference annual energy consumption (RAEC) for beverage coolers in kWh/year in tables 5 and 6 of the model U4E regulations [3] is determined according to the equation $RAEC = (2.1 + (0.006 \times V_{eq})) \times 365$, where V_{eq} is the equivalent volume of the compartments of the beverage cooler with target temperature T_c, in litres, calculated as the gross volume x $(25 - T_c)/20$, in accordance with ISO 22044.

7. This reference value was used as E-low, with E-medium and E-high adjusted to 0.7 and 0.4 respectively of that value, in line with table 10 of the U4E model regulations. For example, for a beverage cooler tested at 25°C with an equivalent volume of 270 litres, RAEC is equal to 1,357.80 kWh/year, resulting in E-low, E-medium, and E-high of 1,357.80, 950.46, and 543.12 kWh/year. This methodology was applied to each of the models of beverage coolers manufactured.

8. Two illustrative examples for the calculation of the eligible additional component incentive for beverage coolers are given in table 2.

Table 2. Examples for the calculation of the eligible additional component incentive for beverage coolers

Particulars	Unit	Reference	Model A	Model B
Equivalent volume	Litre	-	300	200
Baseline energy consumption	kWh/year	A1	1,525	1,211
Target energy consumption	kWh/year	A2	1,098	850
E-low	kWh/year	A3	1,423.50	1,204.50
E-medium	kWh/year	A4	996.45	843.15
E-high	kWh/year	A5	569.40	481.80

[3] https://united4efficiency.org/wp-content/uploads/2021/11/U4E_CommercialRefrig_ModelRegulation_20230728_EN.pdf

Particulars	Unit	Reference	Model A	Model B
Additional component cost	US $/unit	A*	26.68	34.34
Eligible additional component incentive	US $/unit	B=A*/3	8.89	11.45

Note: A* = 35 x (A3-A2)/(A3-A4)

Ice cream display freezers

9. The analogous methodology explained above for beverage coolers was used for ice cream display freezers, noting that the RAEC for beverage coolers in kWh/year in tables 5 and 6 of the model U4E regulations[4] is determined according to the equation RAEC = (1.0 + (0.009 x V_N)) x 365, where V_N is the net volume of the display freezer in litres.

10. This reference value was used as E-low, with E-medium and E-high adjusted to 0.7 and 0.5 respectively of that value, in line with table 10 of the U4E model regulations. For example, for an ice cream display freezer tested at 30°C with a net volume of 250 litres, RAEC is equal to 1,357.80 kWh/year, resulting in E-low, E-medium, and E-high of 1,865.25, 830.38, and 593.13 kWh/year. This methodology was applied to each of the models of ice cream display freezers manufactured.

11. Two illustrative examples for the calculation of the eligible additional component incentive for ice cream display freezers are given in table 3.

Table 3. Examples for the calculation of the eligible additional component incentive for ice cream display freezers

Particulars	Units	Reference	Model A	Model B
Net volume	Litre	-	300	200
Baseline energy consumption	kWh/year	A1	1,375	1,055
Target energy consumption	kWh/year	A2	950	755
E-low	kWh/year	A3	1,350.50	1,022.00
E-medium	kWh/year	A4	945.35	715.40
E-high	kWh/year	A5	540.20	408.80
Additional component cost	US $/unit	A*	34.60	30.48
Eligible additional component incentive	US $/unit	B=A*/3	11.53	10.16

Note: A* = 35 x (A3-A2)/(A3-A4)

[4] Ibid.