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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 agenda¹

PROJECT PROPOSALS: THAILAND

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

Phase-out

- | | | | |
|---|---|------------|--------------------------|
| • | HCFC phase-out management plan (stage III, first tranche) | World Bank | Individual consideration |
|---|---|------------|--------------------------|

Phase-down

- | | | | |
|---|---|------------|--------------------------|
| • | Kigali HFC implementation plan (stage I, first tranche) | World Bank | Individual consideration |
|---|---|------------|--------------------------|

Energy efficiency

- | | | | |
|---|---|------------|--------------------------|
| • | Project to enhance energy efficiency in the manufacturing of air conditioners | World Bank | Individual consideration |
|---|---|------------|--------------------------|

¹ UNEP/OzL.Pro/ExCom/98/1

Summary on strategic integration of projects in Thailand

1. Stage III of the HCFC phase-out management plan (HPMP), stage I of the Kigali HFC implementation plan (KIP), the energy-efficiency project pursuant to decision 94/60 for six enterprises, and the energy-efficiency revolving-fund (EERF) project have been submitted for the consideration of the Executive Committee at its 98th meeting. The overall strategic integration framework governing these submissions is set out below.
2. The strategic integration of Thailand's final HCFC phase-out (stage III of the HPMP), its initial HFC phase-down (stage I of the KIP) — including the large-capacity air-conditioning manufacturing conversion component — and the EERF project yields distinct and mutually reinforcing benefits. This harmonized implementation model builds upon Thailand's strong compliance record and targets the complete elimination of HCFC consumption by 2030, with the exception of a baseline servicing allowance, while reducing HFC consumption well below the levels required under the Kigali Amendment. In so doing, the unified programme accelerates both the manufacturing and commercial adoption of low- and lower-global-warming-potential (GWP) and energy-efficient alternatives, while concurrently developing the national safety and technical capacity necessary to sustain the long-term use of such alternatives.
3. The operational effectiveness of this integrated approach rests on the concurrent engagement of both the supply and demand sides of the market, whereby industrial conversion incentives and end-user financial mechanisms function in a complementary and reinforcing manner to maximize climate and ozone benefits. The financial and technical incentives provided under stage III of the HPMP and stage I of the KIP systematically transition residential and commercial manufacturing away from both ozone-depleting substances and high-GWP HFCs. In parallel, the EERF project provides targeted, low-cost financing to end-users, thereby lowering market entry barriers and catalyzing the accelerated deployment of sustainable cooling technologies across a range of applications at the consumer level. Acting in concert, these components advance the market transition towards low-GWP, high-efficiency technologies and prevent the long-term entrenchment of inefficient and obsolete equipment. Capacity-building activities directed at national banking institutions to independently appraise and finance sustainable cooling portfolios will further support and facilitate this transition.
4. Furthermore, the establishment of a coordinated management and technical assistance structure enhances operational cost-effectiveness across all four initiatives. This governance arrangement ensures that monitoring, reporting and verification protocols related to HPMP, KIP and energy-efficiency targets are implemented within a single, integrated framework. For Thailand, one of the world's leading manufacturing hubs, exporters and consumers of refrigeration and air-conditioning equipment, this comprehensive approach enables a significantly accelerated and lower-cost transition to sustainable cooling, while delivering an optimized return on investment for the Multilateral Fund.
5. The details of each individual project are presented in the sections that follow, with the exception of the EERF project, which is presented in document UNEP/OzL.Pro/ExCom/98/55.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Thailand

PROJECT TITLE	AGENCY
HCFC phase-out management plan (stage III)	World Bank (lead)

ARTICLE 7 DATA (Annex C, Group I)	Year: 2024	305.04 ODP tonnes
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COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)							Year: 2025
Substance	Aerosol	Foam	Firefighting	Refrigeration		Solvent	Total sector consumption
				Manufacturing	Servicing		
HCFC-22					181.16		181.16
HCFC-123			0.38		1.52		1.91
HCFC-141b						34.74	34.74

CONSUMPTION DATA (ODP tonnes)			
2009–2010 baseline:	927.60	Starting point for sustained aggregate reductions:	943.20
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved:	533.20	Remaining:	410.00

ENDORSED BUSINESS PLAN		2026	2027	2028	Total
World Bank	ODS phase-out (ODP tonnes)	4,280,000	0	10,700,000	14,980,000
	Funding (US \$)	59.10	0	147.81	206.91

PROJECT DATA AS AGREED			2026	2027	2028	2029	2030	2031-2032	2033	2034	Total
Consumption (ODP tonnes)	Montreal Protocol limits		301.47	301.47	301.47	301.47	0.00	0.00	0.00	0.00	n/a
	Maximum allowable		301.47	301.47	301.47	301.47	0.00	0.00	0.00	0.00	n/a
Project costs requested in principle (US \$)	World Bank	Project costs	5,574,980	0	6,183,876	0	4,829,180	0	1,832,004	0	18,420,040
		Support costs	390,249	0	432,871	0	338,043	0	128,240	0	1,289,403
Total amounts recommended in principle (US \$)		Project costs	5,574,980	0	6,183,876	0	4,829,180	0	1,832,004	0	18,420,040
		Support costs	390,249	0	432,871	0	338,043	0	128,240	0	1,289,403
		Total funds	5,965,229	0	6,616,747	0	5,167,223	0	1,960,244	0	19,709,443

Request for funding for the first tranche (2026)		
Implementing agency	Funds recommended (US \$)	Support costs (US \$)
World Bank	5,574,980	390,249

Secretariat's recommendation:	Individual consideration
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PROJECT DESCRIPTION

Background

6. On behalf of the Government of Thailand, the World Bank as the designated implementing agency has submitted a request for stage III of the HCFC phase-out management plan (HPMP), in the amount of US \$19,121,480, plus agency support costs of US \$1,338,504, as originally submitted.² The implementation of stage III of the HPMP will phase out the remaining consumption of HCFCs by 2034.

7. The first tranche of stage III of the HPMP being requested at this meeting amounts to US \$5,762,480, plus agency support costs of US \$403,374, for the World Bank, as originally submitted.

Status of implementation of stage II of the HCFC phase-out management plan

8. Stage II of the HPMP for Thailand was approved at the 82nd meeting³ to phase out 298.47 ODP tonnes of HCFCs used in the refrigeration and air-conditioning (RAC) servicing sector and the spray foam sectors, and to meet the 61.8 per cent reduction from the baseline by 2023, at a total cost of US \$3,791,077, plus agency support costs. Stage II of the HPMP was completed in June 2025 in line with the extension approved under decision 95/17(b), and the project completion report was submitted on 30 April 2026, with financial completion expected by October 2026. The third and final tranche of stage II was not requested, as the Government plans to implement future HCFC phase-out activities under stage III.

Report on HCFC consumption

9. The Government of Thailand reported under the country programme (CP) implementation report a consumption of 217.80 ODP tonnes of HCFCs in 2025, which is 76.5 per cent below the HCFC baseline for compliance. The Article 7 data for 2025 has not been reported yet. The 2021–2025 HCFC consumption is shown in table 1.

Table 1. HCFC consumption in 2021–2025 in Thailand (Article 7 data)

HCFC	2021	2022	2023	2024	2025*	Baseline
Metric tonnes (mt)						
HCFC-22	4,344.30	4,100.55	4,230.54	4,779.99	3,293.74	13,028.60
HCFC-123	91.24	102.5	58.84	65.31	95.26	159.75
HCFC-124	0.00	0.00	0.00	0.00	0.00	3.41
HCFC-141b	347.29	595.28	535.21	371.21	315.85	1,865.93
HCFC-142b	0.00	0.00	0.00	0.00	0.00	1.81
HCFC-225	0.00	0.00	0.00	0.00	0.00	54.60
Total (mt)	4,782.83	4,798.33	4,824.59	5,216.51	3,704.85	15,114.10
HCFC-141b in imported pre-blended polyols*	20.13	26.40	0.00	0.00	0.00	142.50**
ODP tonnes						
HCFC-22	238.94	225.53	232.68	262.90	181.16	716.57
HCFC-123	1.82	2.05	1.18	1.31	1.91	3.19
HCFC-124	0.00	0.00	0.00	0.00	0.00	0.08
HCFC-141b	38.20	65.48	58.87	40.83	34.74	205.25
HCFC-142b	0.00	0.00	0.00	0.00	0.00	0.12
HCFC-225	0.00	0.00	0.00	0.00	0.00	2.30
Total (ODP tonnes)	278.96	293.06	292.73	305.04	217.80	927.51
HCFC-141b in imported pre-blended polyols*	2.21	2.90	0.00	0.00	0.00	15.67**

* CP data.

** Average consumption between 2007 and 2009.

² As per the letter of 17 March 2026 from the Department of Industrial Works of the Ministry of Industry of Thailand to the World Bank.

³ Decision 82/60

10. Overall HCFC consumption in Thailand has declined following the successful implementation of activities under stage II of the HPMP, including phase-out measures in the foam and service sectors. This decreasing trend observed over the past five to six years has also been supported by the increased adoption of HCFC-free alternatives, such as HFC-32, hydrocarbons (HCs), and other low-global-warming-potential (GWP) refrigerants in refrigeration equipment. Between 2021 and 2023, consumption levels remained relatively stable due to the impact of the COVID-19 pandemic on the economy, before returning to pre-pandemic levels in 2024. In 2025, consumption declined, largely driven by reductions in the spray foam sector. HCFC-123 is consumed in firefighting applications and for servicing large chillers; however, its consumption is decreasing due to the adoption of HCFC-free alternatives and reduced levels of newly imported HCFC-123.

Country programme implementation report

11. The Government of Thailand reported HCFC sector consumption data under the 2024 CP implementation report that is consistent with the data reported under Article 7 of the Montreal Protocol.

Status of progress and disbursement

Legal framework

12. During stage II of HPMP, government regulations and policies on HCFC control and phase-out were implemented through the issuance and enforcement of annual HCFC quotas for the period 2019–2025; and the promulgation and Cabinet approval of a ban on HCFC-141b for use in all foam applications, including for spray foam, by the end of 2024. The ban took full effect in January 2026, covering all remaining consumption of HCFC-141b in spray foam applications (i.e., by system houses).

Spray foam sector

13. Stage II of the HPMP for Thailand included the conversion of 71 spray foam enterprises consuming HCFC-141b. Delays occurred due to the limited availability of HFO-1233zd and supply constraints for HFOs during 2024–2025, which led enterprises to procure their own HFO-based polyols in order to continue manufacturing their foam products and delivering spray foam services, as well as to maintain access to funding.

14. The implementation of the foam sector plan under stage II of the HPMP was driven by targeted enterprise conversions. Key companies, including Lohr Trade and Consulting Ltd., New Tech & J Service, Narongrit Insulate, Dabco Intertrade, and P.U. Foam Insulation and Trading, completed their individual conversion subprojects by February 2025. This coordinated industrial transition resulted in a cumulative phase-out of 212 mt of HCFC-141b across the sector.

15. Recognizing the limited technical and financial capacity of small enterprises, specialized technical assistance was provided to support groups 1 and 3 enterprises.⁴ These measures focused on addressing technical barriers and securing chemical supply chains by providing reduced hydrofluoroolefin (HFO) pre-blended polyols, enabling a smooth and timely transition away from high-global-warming substances. In addition, two dedicated technical workshops were conducted, focusing on safe equipment operation and practical production demonstrations for alternative technologies. These efforts supported the industry in achieving a cost-effective phase-out of HCFC-141b and facilitated the Government's implementation of regulations prohibiting HCFC-141b in foam applications by January 2026.

⁴ Group 1: SMEs with annual consumption of 10 mt of HCFC-141b or greater; group 3: SMEs with consumption of less than 2 mt.

Refrigeration servicing sector

16. The training programme implemented by both the Office of the Vocational Education Commission (OVEC) and the Department of Skill Development (DSD) successfully reached approximately 4,500 air-conditioning (AC) service technicians; 20 trainers were also trained. Support was provided to training centres for the revision of training syllabus and materials, and training equipment was supplied to 12 centres, each receiving six sets of tools (e.g., recovery cylinder, gas evacuation and charging station, leak detector, and other tools). In addition, the project management unit (PMU), the World Bank, and the training centres conducted an assessment of the training programme to evaluate its impact on technicians and to identify lessons learned to inform stage III of the HPMP.

17. Certification was provided to service technicians upon completion of training at the 12 centres. The certification corresponds to Level 1 professional AC servicing technicians, in accordance with the requirements established by the DSD. A centralized database system was established by DSD, in which all service technicians certified by the training centres under OVEC and DSD are registered.

Level of funds disbursement

18. As of March 2026, of the US \$3,616,532 approved for stage II, US \$3,026,182 (83.7 per cent) had been disbursed. The balance of US \$590,350 is expected to be disbursed by October 2026.

Stage III of the HCFC phase-out management planRemaining consumption eligible for funding

19. After deducting 533.20 ODP tonnes of HCFCs associated with stages I and II of the HPMP, the remaining consumption eligible for funding in stage III amounts to 410.00 ODP tonnes of HCFCs (including 382.46 ODP tonnes of HCFC-22, 3.20 ODP tonnes of HCFC-123, 22.04 ODP tonnes of HCFC-141b, and 2.30 ODP tonnes of HCFC-225 ca/cb).

Sector distribution of HCFCs

20. There are approximately 35,000 technicians and 3,500 workshops operating in the servicing sector, consuming HCFC-22 to service room air conditioners, chillers and central AC units, and industrial and large commercial refrigeration, as shown in table 2. HCFC-22 represents approximately 30 per cent of refrigerants used in the servicing sector, based on total HCFC and HFC consumption in that sector.

Table 2. Estimation of demand for HCFC-22 in the RAC servicing sector in Thailand

Sector/Application	(a)	(b)	(c) = (a)*(b)	(d)	(c)*(d)
	Equipment inventory	Average charge (kg)	HCFC bank (mt)	Estimated bank refilled during servicing (%)	Annual need for servicing (mt)
Room AC (unitary and split)	12,500,000	1.20	15,000	19.12	2,868
Commercial AC (rooftop, multi-split units, chillers)	250,000	3.00	750	25.20	189
Commercial refrigeration (medium condensing units)	180,000	3.00	540	20.00	108
Industrial refrigeration (medium to large condensing units, centralized systems)	8,000	20.00	160	40.00	64

Sector/Application	(a)	(b)	(c) = (a)*(b)	(d)	(c)*(d)
	Equipment inventory	Average charge (kg)	HCFC bank (mt)	Estimated bank refilled during servicing (%)	Annual need for servicing (mt)
Chillers	3,500	500.00	1,750	3.40	65
Total	12,941,500	-	18,200	-	3,294

Note: These are best estimates based on information available on consumption and certain assumptions (e.g., average charge size, estimated inventory).

21. In 2025, approximately 315.9 mt of HCFC-141b was consumed in solvent applications, primarily in metal cleaning, specialized cleaning of optical lenses, and cleaning compressors; consumption of 19.05 mt HCFC-123 was reported in portable fire-extinguishers.

Phase-out strategy

22. Stage III of the HPMP will focus on strengthening the regulatory framework and control mechanism, enhancing the enforcement capacity of customs authorities, and further building the capacity of the servicing sector, including training institutions. It will also support the implementation of an end-user incentive programme to promote equipment replacement and refrigerant recovery, recycling and disposal. In addition, the Government will develop the relevant regulatory measures to manage the HCFC servicing tail for existing equipment, in line with Article 5, paragraph 8 ter(e)(i), of the Montreal Protocol.

Proposed activities

23. Activities proposed for implementation in the servicing sector under stage III and in the first tranche and their cost breakdown are presented in table 3.

Table 3. Servicing sector activities and their costs under stage III of the HPMP for Thailand, as submitted

Activity	Cost (US \$)	
	Stage III	First tranche
1. Policy and regulatory framework: 1.1. Introduce and enforce regulations to establish, by 1 January 2030, a prohibition on the use of HCFCs in manufacturing (including portable fire extinguishers), a ban on the use of HCFC-141b in solvent cleaning applications, and a ban on the installation of new chillers and other HCFC-based RAC systems; 1.2. Continue to implement HCFC import control measures, including mandatory reporting of end-users by importers and monitoring of sales and stock carry-over; 1.3. Maintain limited HCFC imports only for servicing existing equipment between 2030-2034	Co-financing from Government	Co-financing from Government
2. Customs and enforcement training: 2.1. Conduct 20 training workshops for approximately 700 customs and enforcement officers at major checkpoints, covering topics such as ozone protection and the Montreal Protocol, inspection techniques, use and maintenance of refrigerant identifiers, risk profiling, safety in handling cylinders, Harmonized System codes, declaration and standard operating procedures for handling unauthorized shipments; integrate trade control topics into the customs training curriculum (US \$225,000); 2.2. Procure and distribute 50 refrigerant identifiers to selected customs checkpoints and the Department of Industrial Works (DIW), along with consumables for more sustainable use (US \$340,000);	665,000	33,750

Activity	Cost (US \$)	
	Stage III	First tranche
2.3. Organize regular training workshops with HCFC importers on impending HCFC restrictions and total phase-out (US \$100,000)		
3. Residential air-conditioning servicing: 3.1. Increase the number of public training centres from 12 to 18 nationwide; provide 36 sets of training equipment (e.g., vacuum pumps, electronic leak detectors, refrigerant recovery cylinders, and service tools and accessories) for the six additional training centres (US \$136,080); 3.2. Train and certify at least 15,000 service technicians on the safe and efficient handling of alternative refrigerants and technologies, including refrigerant recovery practices and basic repair of electronic controllers for split-type inverter air conditioners (US \$4,500,000); 3.3. Provide 15,000 sets of basic service tools, which could include recovery units, vacuum pumps, and copper pipe flaring sets, as incentive for certified technicians (US \$5,400,000); 3.4. Supply 108 sets of AC mocking training units, recovery machines, refrigerant cylinders, tools and accessories for training and certification support to 15,000 technicians (US \$761,400); 3.5. Adopt a strengthened public-private partnership approach to expand national training capacity and enhance access to high-quality RAC servicing programmes	10,797,480	2,877,480
4. Industrial refrigeration servicing for ammonia-based systems: 4.1. Establish a virtual reality-based specialized training programme at DSD and a selected vocational school under OVEC; 4.2. Develop a training curriculum and a competency-based testing module (US \$60,000); 4.3. Install virtual reality training systems, including two hardware/control systems and two simulation systems, and annual fee for software license and maintenance (15 units per set and eight-year license fee) (US \$790,000); 4.4. Train 500 service technicians and technical students on the safe and efficient operation of ammonia-based refrigeration technology with two training experts (US \$415,000); 4.5. Conduct 20 train-the-trainer programmes on operations and safe maintenance practices of ammonia-based systems (US \$300,000)	1,565,000	0
5. End-user incentive programme: 5.1. Provide financial incentives for the replacement of approximately 26,000 outdated residential AC and refrigeration equipment (12,000-18,000 BTU/hour) ⁵ with new, non-HCFC, lower-GWP models, over an eight-year period, in coordination with stage I of the Kigali HFC implementation plan (KIP) and the energy-efficiency revolving-fund (EERF) project (cash coupon of approximately US \$150 per unit) (US \$4,000,000); 5.2. Implement a public awareness campaign targeting industries and commercial entities to promote the uptake of low-GWP equipment (US \$300,000)	4,300,000	2,150,000
6. Data and monitoring systems: Upgrade the DIW electronic database to monitor and record HCFC use in servicing of industrial refrigeration systems to control and prevent unauthorized HCFC imports	250,000	250,000

⁵ BTU/hour: British Thermal Unit per hour.

Activity	Cost (US \$)	
	Stage III	First tranche
7. Solvent sector: Provide training on the safe use and handling of alternative solvents to support the sustainable and permanent phase-out of remaining HCFC-141b consumption	100,000	0
8. PMU activities (see paragraphs 24 to 26)	1,444,000	451,250
Total	19,121,480	5,762,480

Project implementation and monitoring

24. Three PMUs will jointly oversee HPMP implementation: the DIW-PMU, responsible for overall project coordination, policy and regulatory support, fiduciary oversight, monitoring, reporting, and stakeholder engagement; the PMU under the Government Savings Bank (GSB), acting as a financial agent for management of subprojects, subgrant disbursement and providing implementation assistance to the end-user incentive programme; and the PMU under the Department of Alternative Energy Development and Efficiency (DEDE), managing the EERF project, including the end-user programme, and providing support for monitoring, technical advisory services and integration of refrigerant choice with labelling schemes.

25. Total requested cost for DIW amounts to US \$764,000, comprising: personnel (US \$536,000); consultancy services (US \$124,000); office equipment (US \$64,000); and travel (US \$40,000). GSB requested 2 per cent of the end-user subproject value amounting to US \$80,000. This represents a total of US \$844,000 in HPMP PMU costs.

26. DEDE requested US \$600,000 to ensure effective implementation and long-term sustainability of project activities, and this relates to EERF technical assistance and project support activities, including a consultancy for project appraisals.

Total cost of stage III of the HCFC phase-out management plan

27. The total cost of stage III of the HPMP for Thailand has been estimated at US \$19,121,480 (plus agency support costs), as originally submitted, to achieve a 100 per cent reduction by 2030 (except for the servicing tail) and to eliminate servicing-tail consumption by 2034. The proposed activities and cost breakdown are summarized in table 3 above.

Implementation plan for the first tranche of stage III of the HCFC phase-out management plan

28. The first funding tranche of stage III of the HPMP in the total amount of US \$5,762,480 will be implemented between July 2026 and December 2028. Detailed information on the activities included in the first tranche, indicating adjustments made and the level of funds agreed, is presented in paragraph 44 below.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

29. The Secretariat reviewed stage III of the HPMP in light of stages I and II, the policies and guidelines of the Multilateral Fund, including the criteria for funding HCFC phase-out in the consumption sector for stage II of HPMPs (decisions 74/50 and 90/31), stage I of the KIP submitted to the present meeting, and the 2026–2028 business plan of the Multilateral Fund.

Overarching strategy

30. The Government of Thailand proposes to meet the 100 per cent reduction of its HCFC baseline consumption by 2030, and to maintain a maximum annual consumption of HCFCs in the period of 2030 to 2033 at a level consistent with Article 5, paragraph 8 ter(e)(i), of the Montreal Protocol.⁶ The World Bank indicated that the Government intends to implement regulatory measures to achieve complete phase-out by 2034. During the period 2030 to 2033, importers requesting quotas will be required to provide evidence that the imported HCFCs will be used exclusively for servicing purposes. In the implementation progress report of the final tranche, the Government will provide an update on the enforcement of the prohibition and any changes therein, including to the policy measures.

31. In line with decision 86/51, the Government of Thailand agreed to submit, when requesting the tranche in 2030, a detailed description of the regulatory and policy framework in place to implement measures to ensure that HCFC consumption is in compliance with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol for the period 2030–2033, and, if Thailand intended to have consumption in the period 2030–2033, in line with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol, proposed modifications to its Agreement with the Executive Committee covering the period beyond 2030. The Government of Thailand will also submit, upon requesting the final tranche and following consultation with their national stakeholders, an updated plan of action confirming whether to use servicing tail consumption from 2034 onwards.

Legal framework

32. The Government of Thailand has issued HCFC import quotas for 2026 at 241.63 ODP tonnes, which is lower than the Montreal Protocol control targets.

33. With regard to the implementation of prohibition of HCFC-based equipment in addition to existing regulations, the World Bank confirmed that, effective 1 January 2030, the Government will: (i) prohibit the use of HCFCs in the manufacture of portable fire extinguishers; (ii) prohibit the use of HCFC-141b in solvent cleaning applications; and (iii) ban the installation of new chillers and other RAC systems that use HCFCs.

Technical and cost-related issues

34. Regarding the need for certification of technicians using ammonia-based equipment, the World Bank explained that, historically, technicians were trained on the job by individual end-users or system owners, resulting in uneven skill levels. To ensure the safe servicing of ammonia-based equipment in accordance with good practices, technicians will be trained through authorized training centres and certified upon completion. Under stage III of the HPMP, training is proposed for 20 trainers and 500 technicians on good and safe servicing practices for ammonia-based equipment. Two selected facilities in Thailand will be equipped to host the training programmes.

35. With regard to the end-user incentive programme, the World Bank explained that it aims to accelerate the replacement of HCFC-based AC and refrigeration equipment, thereby reducing future servicing demand. Early replacement of such equipment is critical for achieving Thailand's obligation to phase out HCFC consumption by 2030, except for the servicing tail during the period 2030–2033, and to eliminate remaining servicing-tail consumption by 2034. The proposed incentive of US \$150 per unit, combined with low-cost repayment spread over 10 installments through credit card companies for new, energy-efficient air conditioners with lower GWP, is expected to further accelerate the reduction of HCFC

⁶ HCFC consumption may exceed zero in any year so long as the sum of its calculated levels of consumption over the ten-year period from 1 January 2030 to 1 January 2040, divided by 10, does not exceed 2.5 per cent of the HCFC baseline.

consumption. The World Bank would report on the phase-out of HCFC achieved through the end-user project and on energy-efficiency gains, where applicable, in line with decision 92/36(g).

36. The World Bank further indicated that retrofit training programmes of existing equipment will discourage retrofits with flammable refrigerants, ensuring that all such activities are carried out safely and comply with national safety regulations.

Certification of technicians

37. The Secretariat notes that stage III of the HPMP proposes a comprehensive capacity-building programme in the servicing sector, including the training and certification of at least 15,000 residential AC technicians to Level 1 professional standards under the DSD. Building on lessons learned from stages I and II, the programme expands the existing training infrastructure through a strengthened public-private partnership model, extending reach beyond public institutions to private training centres. Key activities include the provision of training equipment through a proven voucher mechanism, development of updated curricula covering installation, operation and repair of all RAC technologies (including low-/lower-GWP alternatives), train-the-trainer programmes, coverage of certification costs, and the establishment of virtual reality-based training facilities for ammonia-based refrigeration at two designated national institutions.

38. Certified technicians will receive complimentary basic service tools as an incentive to participate in the programme. In addition, the programme will be enforced for servicing ammonia-based equipment as explained previously, thus ensuring safe servicing practices. The integration of certification activities with the EERF project further strengthens the complementarity between ozone and climate objectives, supporting Thailand's transition to a low-GWP servicing sector in line with the Montreal Protocol and the Kigali Amendment.

39. The World Bank also emphasized that strengthening technicians' competencies in refrigerant recovery, recycling and reuse will directly reduce demand for virgin HCFC imports in advance of the 2030 consumption ban, while simultaneously building national capacity to safely service equipment using environmentally sound, energy-efficient alternative refrigerants beyond 2034.

Project management and monitoring

40. The actual PMU costs for the implementation of stage III of the HPMP amount to US \$844,000. The US \$600,000 has been allocated to DEDE for the technical assistance component of the EERF project. Even with the inclusion of this US \$600,000 for complimentary activities outside the HPMP, the total project management and monitoring costs, covering a period of eight years, would represent 7.8 per cent of the agreed HPMP costs, as shown in table 4 below. This level of funding provides a cost-effective project management system to support the sustainable phase-out of HCFCs and to promote the adoption of energy-efficient alternatives in RAC applications.

Total project cost

41. Based on the review of the different project cost elements, the agreed costs for stage III of the HPMP are presented in table 4.

Table 4: Servicing sector activities and their costs under stage III of the HPMP for Thailand as agreed

Activity	Cost (US \$)	
	As submitted	As agreed
1. Policy and regulatory framework*	Co-financing from Government	Co-financing from Government
2. Customs and enforcement training	665,000	665,000

Activity	Cost (US \$)	
	As submitted	As agreed
3. Residential air-conditioning servicing	10,797,480	10,796,040
4. Industrial refrigeration servicing	1,565,000	1,565,000
5. End-user incentive programme*	4,300,000	4,200,000
6. Data and monitoring systems	250,000	250,000
7. Solvent sector	100,000	100,000
8. PMU activities	1,444,000	844,000**
Total	19,121,480	18,420,040

*The difference in agreed costs is on account of adjustments for calculation errors in these activities.

**The US \$600,000 allocated to DEDE for the PMU component is included in the project management cost of the EERF project; further details are provided in document UNEP/OzL.Pro/ExCom/98/55.

42. The total cost of stage III of the HPMP amounts to US \$18,420,040, with cost-effectiveness levels of US \$2.49/kg based on the remaining consumption eligible for funding of 7,383.9 mt or US \$4.02/kg based on the average consumption for the period 2023–2025 of 4,581.98 mt.

43. The funding for the first tranche was agreed as submitted, with the exception of the PMU costs, which were set at US \$263,750 to reflect the inclusion of the US \$600,000 allocated to DEDE under the EERF project, bringing the total for the tranche to US \$5,574,980.

Agreed implementation plan for the first tranche of stage III of the HCFC phase-out management plan

44. The agreed plan of action will include the following activities:

- (a) *Customs and enforcement training (US \$33,750)*: Conduct three training workshops for approximately 100 customs and enforcement officers at major checkpoints;
- (b) *Residential air-conditioning servicing (US \$2,877,480)*: Procure training equipment to six centres (AC mocking units, oscilloscopes, recovery machines and refrigerant cylinders) (US \$897,480); train and certify at least 3,000 service technicians on the safe and efficient handling of alternative refrigerants and technologies, including refrigerant recovery practices and basic repair of electronic controllers for split-type inverter air-conditioners (US \$1,980,000);
- (c) *End-user incentive programme (US \$2,150,000)*: Provide financial incentives to support the replacement of an estimated 13,300 outdated AC and refrigeration equipment (US \$2,000,000); implement the first half of a public awareness campaign targeting industries and commercial entities to promote the uptake of low-GWP equipment (US \$150,000);
- (d) *Data and monitoring systems (US \$250,000)*: Upgrade the DIW electronic database to monitor and record HCFC use in servicing of primarily industrial refrigeration systems to control and prevent unauthorized HCFC imports;
- (e) *Project monitoring (US \$263,750)*: This includes staff and consultant (US \$206,250); travel cost (US \$12,500); consumables (US \$20,000); and fee for GSB-PMU for the management of sub-projects (US \$25,000).

Co-financing

45. The estimated co-financing includes in-kind contributions from the Government of Thailand for policy and regulatory measures.

2026–2028 draft business plan of the Multilateral Fund

46. The World Bank is requesting US \$18,420,040, plus agency support costs, for the implementation of stage III of the HPMP for Thailand. The total requested value of US \$12,581,976, including agency support costs for the period of 2026–2028, is US \$2,398,024 below the amount in the business plan.

Gender policy implementation

47. The World Bank will implement the Multilateral Fund's operational policy on gender mainstreaming throughout stage III. For ongoing project activities, an equal opportunity statement will be included to ensure that female candidates are encouraged to participate, in line with national policies. The World Bank is currently developing performance targets on women's participation in the activities of stage III in consultation with DIW. This will include a detailed results framework with intermediate indicators and targets. In addition, sex-disaggregated data and information collected under stage II have been used to inform the development of actions and targets for stage III.

Sustainability of the HCFC phase-out and assessment of risks

48. Activities under the HPMP are progressing satisfactorily, and overall HCFC consumption continues to decline compared to 2020 levels. The Government maintains an effective licensing and quota system, with remaining HCFC consumption predominantly in RAC applications. Risks associated with the continued use of HCFCs in aging RAC equipment will be mitigated through the promotion of HCFC-free alternatives, implementation of incentive schemes for energy-efficient equipment, and the continued uptake of low-/lower-GWP alternatives across various activities, including KIP activities scheduled to commence in 2026, as well as training and capacity-building of technicians using alternative technologies. The limited use of HCFC-141b in the solvent sector is expected to decline over time as enterprises adopt alternatives introduced early in stage III. The sustainable adoption of alternatives will be monitored through an integrated monitoring and reporting framework covering the HPMP, the KIP and other projects.

Impact on the climate

49. The activities proposed in the servicing sector, including better refrigerant containment through training and provision of equipment, will reduce the use of HCFC-22 in servicing. Each kilogram of HCFC-22 not emitted due to better refrigeration practices results in the savings of approximately 1.8 CO₂-equivalent tonnes. Although a calculation of the impact on the climate was not included in the HPMP, the activities planned by Thailand, including promoting low-GWP alternatives, adopting energy-efficient refrigeration and AC equipment, and enhancing refrigerant recovery and reuse, indicate that the implementation of the HPMP will reduce refrigerant emissions in the atmosphere, resulting in climate benefits.

Draft Agreement

50. A draft Agreement between the Government of Thailand and the Executive Committee for stage III of the HPMP is contained in annex I to the present document.

RECOMMENDATION

51. The Executive Committee may wish to consider:

- (a) Approving, in principle, stage III of the HCFC phase-out management plan (HPMP) for Thailand for the period from 2026 to 2034 for the complete phase-out of HCFC consumption, in the amount of US \$18,420,040, plus agency support costs of

US \$1,289,403, for the World Bank, on the understanding that no more funding from the Multilateral Fund will be provided for the phase-out of HCFCs;

- (b) Noting the commitment of the Government of Thailand to completely phase out HCFCs by 1 January 2030, and that HCFCs will not be imported after that date, except for those allowed for a servicing tail between 2030 and 2040, where required, consistent with the provisions of the Montreal Protocol;
- (c) Noting that, upon completion of the end-user project included in stage III of the HPMP, the World Bank will submit a final report on their implementation in line with decision 92/36(g), including the HCFC phase-out and energy-efficiency gains achieved;
- (d) Deducting 410.00 ODP tonnes of HCFCs from the remaining HCFC consumption eligible for funding;
- (e) Approving the draft Agreement between the Government of Thailand and the Executive Committee for the reduction in consumption of HCFCs, in accordance with stage III of the HPMP, contained in annex I to the present document;
- (f) That, to allow for consideration of the third tranche of its HPMP, the Government of Thailand should submit:
 - (i) A detailed description of the regulatory and policy framework in place to implement measures to ensure that HCFC consumption was in compliance with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol for the period 2030–2033;
 - (ii) If Thailand were intending to have consumption during the period 2030–2033, in line with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol, proposed modifications to its Agreement with the Executive Committee covering the period beyond 2030;
- (g) That, to allow for consideration of the final tranche of its HPMP, the Government of Thailand should confirm whether to use remaining servicing tail consumption from 2034 onward and to provide an updated plan of action and its Agreement with the Executive Committee accordingly; and
- (h) Approving the first tranche of stage III of the HPMP for Thailand, and the corresponding tranche implementation plan, in the amount of US \$5,574,980, plus agency support costs of US \$390,249, for the World Bank.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Thailand

PROJECT TITLE	AGENCY
Kigali HFC implementation plan (stage I)	World Bank (lead)

ARTICLE 7 DATA (Annex F)	Year: 2024	27,542.35 mt	32,708,003 CO ₂ -eq tonnes
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COUNTRY PROGRAMME SECTORAL DATA (CO ₂ -eq tonnes) AND ACTIVITIES								Year:	2025
	Aerosol	Foam	Fire-fighting	Air-conditioning (AC) and refrigeration				Solvent	Other
				Manufacturing			Servicing		
				Refrigeration	AC	Other			
HFCs	321,327	124,112	97,302	3,100,530	17,636,629		12,531,968	28,405	
HFCs in imported pre-blended polyols*		198,275							
Planned activities agreed (Y/N)					Y		Y	Y	

*Average consumption of HFCs contained in imported pre-blended polyols in 2022–2024 is not available.

AVERAGE 2020–2022 HFC CONSUMPTION IN SERVICING	8,652.09 mt	14,238,650 CO ₂ -eq tonnes
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BASELINE DATA (CO ₂ -eq tonnes)	2020	2021	2022	Average 2020–2022
HFC annual consumption	32,493,194	34,603,353	62,029,738	43,042,095
HCFC baseline (65%)				16,228,856
HFC baseline				59,270,951

HFC CONSUMPTION ELIGIBLE FOR FUNDING (CO ₂ -eq tonnes)	
Starting point for sustained aggregate reductions	TBD
Previously approved HFC phase-down investment projects	Yes
Aggregate reductions from previously approved projects	12,555

PROJECT DATA AS AGREED			2026*	2027	2028	2029	2030	2031-2032	2033	2034	Total
Consumption (CO ₂ -eq tonnes)	Montreal Protocol limits		59,270,951			53,343,856					n/a
	Maximum allowable		59,270,951			47,416,761					n/a
	Reduction from baseline (%)		0.0			20.0					n/a
Project costs requested in principle (US \$)	World Bank	Project costs	3,121,489	0	3,629,630	0	3,039,322	0	341,829	0	10,132,270
		Support costs	218,504	0	254,074	0	212,753	0	23,928	0	709,259
Total amounts recommended in principle (US \$)		Project costs	3,121,489	0	3,629,630	0	3,039,322	0	341,829	0	10,132,270
		Support costs	218,504	0	254,074	0	212,753	0	23,928	0	709,259
		Total funds	3,339,993	0	3,883,704	0	3,252,075	0	365,757	0	10,841,529

* Recommended for approval at the present meeting.

Reduction from remaining consumption eligible for funding in stage I (CO ₂ -eq tonnes)*	2,830,814
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*Includes the reduction of 12,555 CO₂-eq tonnes (8.78 mt) from a previously approved project.

Secretariat's recommendation	Individual consideration
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PROJECT DESCRIPTION

52. The present document contains the following sections:

- I. Summary of the proposal as submitted
- II. Background: Status of implementation of the HCFC phase-out management plan and previous HFC-related activities
- III. HFC consumption overview: HFC consumption levels, trends, and consumption by sector
- IV. Stage I of the Kigali HFC implementation plan, as submitted: Regulatory framework, phase-down strategy, total stage cost, and implementation plan for the first tranche
- V. Secretariat's comments, including the agreed cost of activities
- VI. Recommendation

I. Summary of the proposal as submitted

53. On behalf of the Government of Thailand, the World Bank as the designated implementing agency has submitted a request for stage I of the Kigali HFC implementation plan (KIP), in the amount of US \$10,460,823, plus agency support costs of US \$732,258, as originally submitted.⁷

54. The implementation of stage I of the KIP will assist the Government of Thailand in meeting the target of 20 per cent reduction from its HFC baseline consumption by 1 January 2034.

55. The first tranche of stage I of the KIP being requested at this meeting amounts to US \$3,121,490, plus agency support costs of US \$218,504 for the World Bank, as originally submitted, for the period of July 2026 to December 2028.

II. Background

Status of implementation of the HCFC phase-out management plan

56. Table 5 presents information on the HCFC phase-out management plan (HPMP) in Thailand as of May 2026.

Table 5. HPMP implementation status for Thailand

	Stage I	Stage II
Meetings when HPMP was approved or updated	68 th /77 th /80 th	82 nd
Reduction from baseline	15% by 2018	61.8% by 2023
Total stage cost (US \$)	18,108,630	3,791,077
Date of completion (actual or planned)	31 December 2018	30 June 2025

⁷ As per the letter of 17 March 2026 from the Department of Industrial Works of the Ministry of Industry of Thailand to the World Bank.

Status of implementation of previous HFC-related activities

57. Table 6 presents an overview of activities implemented in Thailand in the context of the Kigali Amendment that have been funded by the Multilateral Fund.

Table 6. Previously approved HFC-related activities in Thailand

Approval meeting	Project title	Implementing agency	Cost (US \$)	Date of completion
74 th	Survey of ODS alternatives	World Bank	120,000	November 2017
80 th	Enabling activities for HFC phase-down	World Bank	250,000	December 2021
82 nd	Conversion from HFC to propane (R-290) and isobutene (R-600a) as a refrigerant in manufacturing commercial refrigeration appliances in Pattana Intercool Co. Ltd.	World Bank	183,514	December 2021

III. HFC consumption overview

HFC consumption levels

58. Thailand only imports (does not produce) HFCs for use in the manufacturing and servicing sectors. The most consumed substances in 2025 were HFC-32 (30.9 per cent of total HFC consumption in CO₂-equivalent (CO₂-eq) tonnes), R-410A (27.4 per cent), HFC-134a (24.9 per cent), R-404A (11.2 per cent), and other HFCs (5.5 per cent). Table 7 presents the country's HFC consumption as reported to the Ozone Secretariat under Article 7 of the Montreal Protocol, and the country's HFC baseline.

Table 7. 2020–2025 HFC consumption and baseline for Thailand (Article 7 data)

HFC	GWP	2020	2021	2022	2023***	2024	2025*
Metric tonnes (mt)							
HFC-125	3,500	82.74	138.60	248.67	63.99	39.67	0.00
HFC-134a	1,430	6,200.92	4,759.14	8,669.08	4,032.29	5,803.78	5,897.69
HFC-143a	4,470	89.50	98.70	279.94	8.47	5.58	0.00
HFC-152a	124	173.87	224.92	236.19	283.81	343.08	526.43
HFC-227ea	3,220	24.44	46.86	30.05	20.88	7.20	9.04
HFC-23	14,800	3.95	3.07	7.93	12.28	2.00	5.10
HFC-236fa	9,810	6.67	9.09	7.20	23.63	13.76	6.95
HFC-245fa	1,030	203.65	147.93	465.04	171.76	153.47	120.50
HFC-32	675	8,050.20	10,141.48	12,033.36	10,136.63	15,262.31	15,512.93
HFC-365mfc	794	83.34	62.89	48.08	2.71	0.00	0.00
HFC-43-10mee	1,640	4.75	7.18	7.64	6.63	3.69	2.88
R-404A	3,922	471.02	500.28	4,360.35	-2,866.53	781.68	965.80
R-407C	1,774	132.60	170.37	262.33	207.23	199.31	189.52
R-407F	1,825	16.69	24.56	33.52	61.12	92.00	61.04
R-410A	2,088	7,018.90	8,103.01	9,792.79	4,728.41	4,362.13	4,445.76
R-448A	1,386	36.16	49.73	0.00	5.54	11.88	5.10
R-507A	3,985	41.07	50.07	115.98	122.05	175.20	174.39
Other**		12.44	15.79	53.74	31.72	285.61	729.50
Total (mt)		22,652.90	24,553.65	36,651.87	17,052.65	27,542.35	28,652.63
HFC-245fa in imported pre-blended polyols*		n/p	n/p	n/p	n/p	22.88	192.50

HFC	GWP	2020	2021	2022	2023***	2024	2025*
CO₂-eq tonnes							
HFC-125	3,500	289,576	485,086	870,328	223,965	138,845	0
HFC-134a	1,430	8,867,318	6,805,572	12,396,777	5,766,175	8,299,405	8,433,697
HFC-143a	4,470	400,065	441,167	1,251,309	37,861	24,943	0
HFC-152a	124	21,559	27,890	29,287	35,192	42,542	65,277
HFC-227ea	3,220	78,684	150,876	96,755	67,234	23,184	29,122
HFC-23	14,800	58,386	45,436	117,394	181,744	29,600	75,450
HFC-236fa	9,810	65,413	89,173	70,632	231,810	134,986	68,180
HFC-245fa	1,030	209,763	152,363	478,992	176,913	158,074	124,112
HFC-32	675	5,433,888	6,845,500	8,122,515	6,842,225	10,302,059	10,471,228
HFC-365mfc	794	66,171	49,936	38,178	2,152	0	0
HFC-43-10mee	1,640	7,797	11,775	12,530	10,873	6,052	4,723
R-404A	3,922	1,847,132	1,961,898	17,099,560	-11,241,384	3,065,436	3,787,473
R-407C	1,774	235,216	302,211	465,331	367,595	353,546	336,175
R-407F	1,825	30,451	44,810	61,148	111,513	167,854	111,367
R-410A	2,088	14,651,956	16,915,027	20,442,439	9,870,556	9,105,946	9,280,524
R-448A	1,386	50,111	68,916	0	7,677	16,463	7,068
R-507A	3,985	163,672	199,529	462,188	486,369	698,172	694,960
Other**		16,037	6,189	14,375	42,478	140,897	350,917
Total (CO₂-eq tonnes)		32,493,194	34,603,353	62,029,738	13,220,949	32,708,003	33,840,272
HFC-245fa in imported pre-blended polyols*		n/p	n/p	n/p	n/p	23,566	198,275
HFC baseline calculation (CO₂-eq tonnes)							
Average HFC consumption in 2020–2022						43,042,095	
HCFC baseline (65%)						16,228,856	
HFC baseline						59,270,951	
Average consumption of HFCs in imported pre-blended polyols in 2022–2024						N/A	

* Country programme data

** Including R-407A, R-407H, R-417A, R-449A, R-452A, R-452B, R-454B, R-454C, R-508B, R-513A.

*** Data from the KIP submission

Manufacturing of HFC blends

59. The blending of HFC refrigerants in Thailand is a limited activity confined to a single importer-blender. All other HFC blends consumed in the country (R-407C, R-410A, R-448A, R-449A, R-452B, R-454A/B/C, R-455A, R-463A, R-507A, R-508B, R-513A, and others) are imported pre-blended rather than formulated domestically. Based on import records, only R-404A was blended locally by one company, using HFC-125, HFC-134a and HFC-143a. While the information available under the KIP indicates that HFC-125, HFC-134a, HFC-143a and HFC-152a may be used for manufacturing blends (e.g., R-404A, R-407C, R-507A, R-415A, and R-415B), verified import records do not confirm sustained domestic manufacturing of these blends, suggesting that those secondary blending uses were either intermittent, marginal or did not materialize at scale. Reported quantities of locally blended R-404A were 89.50 mt in 2020, 98.70 mt in 2021, 279.94 mt in 2022, 8.47 mt in 2023, and 5.58 mt in 2024; data for 2025 is not available. Limited bulk-HFC blending activity by individual importers has been reported; for example, in 2024, one trading company used HFC-125 to blend approximately 33.83 mt of R-407C, 2.36 mt of R-404A, and 2.79 mt of R-507A, while HFC-134a (about 70.6 mt) was used to support R-404A and R-407C blends. However, the Government clarified that these volumes are not reported separately as “locally blended” production. Locally blended R-404A is sold to the domestic market for standalone commercial refrigeration, cold storage and industrial refrigeration; no exports of locally blended product were reported. Overall, HFC blending is not targeted for a separate intervention under stage I of the KIP.

Country programme implementation report

60. The sectoral HFC consumption data provided by the Government of Thailand in its country programme (CP) implementation report for 2024 is consistent with the data reported under Article 7 of the Montreal Protocol.

HFC consumption trends

61. Thailand's HFC consumption increased steadily between 2020 and 2024, with a temporary peak in 2022 due to stockpiling of HFCs, primarily HFC-134a, R-404A, R-410A; the stockpiled substances were re-exported in 2023. HFC-32 has increased as Thailand was among the first countries to transition to HFC-32 in air-conditioning (AC) applications, replacing R-410A and HCFC-22. HFC-134a is used in AC, including mobile air-conditioning (MAC), as well as refrigeration applications. HFC-152a and R-404A has also shown steady growth over the past five years.

HFC consumption by sector

62. HFCs are consumed in the manufacturing sector (72.0 per cent in mt and 65.8 per cent in CO₂-eq tonnes) and the servicing sector (28.0 per cent in mt and 34.2 per cent in CO₂-eq tonnes). Within manufacturing, the largest percentage is attributed to residential AC (47.0 per cent in mt and 30.0 per cent in CO₂-eq tonnes), followed by commercial AC (13.1 per cent in mt and 16.8 per cent in CO₂-eq tonnes), MAC (5.2 per cent in mt and 6.2 per cent in CO₂-eq tonnes), commercial refrigeration (2.7 per cent in mt and 8.1 per cent in CO₂-eq tonnes), and other subsectors, as shown in tables 8 and 9.

63. Within servicing, HFCs are mainly consumed in the residential AC subsector (12.9 per cent in mt and 14.1 per cent in CO₂-eq tonnes), followed by MAC (12.8 per cent in mt and 15.4 per cent in CO₂-eq tonnes), and other subsectors, as shown in tables 8 and 9.

Table 8. 2024 HFC consumption in Thailand by sector (mt)

Sector	HFC-32	HFC-134a	HFC-152a	R-410A	R-404A	R-454B	R-407C	Other	Total	Share of total (%)
Manufacturing										
Domestic refrigeration	0.00	435.47	0.00	0.00	0.00	0.00	0.00	0.00	435.47	1.6
Commercial refrigeration	0.00	45.47	0.00	0.00	520.76	0.00	49.70	116.73	732.66	2.7
Residential AC	11,879.32	0.00	0.00	800.00	0.00	255.01	0.00	0.00	12,934.33	47.0
MAC	0.00	1,418.00	0.00	0.00	0.00	0.00	0.00	0.00	1,418.00	5.2
Commercial AC	1,350.00	123.40	0.00	2,000.00	0.00	0.00	124.62	0.00	3,598.02	13.1
PU foam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	183.27	183.27	0.7
Aerosol	0.00	200.00	7.22	0.00	0.00	0.00	0.00	0.00	207.22	0.8
Firefighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.71	60.71	0.2
Solvent	0.00	0.00	161.85	0.00	0.00	0.00	0.00	3.88	165.73	0.6
Other	0.00	62.21	0.00	0.00	0.00	0.00	0.00	0.00	62.21	0.2
Subtotal manufacturing	13,229.32	2,284.55	169.07	2,800.00	520.76	255.01	174.32	364.59	19,797.62	72.0
Refrigeration and air-conditioning servicing*										
Refrigeration subsectors										
Commercial	0.00	0.00	0.00	0.00	260.38	0.00	24.85	179.80	465.03	1.7
Industrial	0.00	0.00	173.77	0.00	0.00	0.00	0.00	2.28	176.05	0.6
Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	1.13	0.0

Sector	HFC-32	HFC-134a	HFC-152a	R-410A	R-404A	R-454B	R-407C	Other	Total	Share of total (%)
Air-conditioning subsectors										
Residential	1,990.58	0.00	0.00	1,562.13	0.00	0.00	0.00	0.00	3,552.71	12.9
Mobile	0.00	3,515.50	0.00	0.00	0.00	0.00	0.00	0.00	3,515.50	12.8
Subtotal servicing	1,990.58	3,515.50	173.77	1,562.13	260.38	0.00	24.85	183.21	7,710.42	28.0
Total	15,219.90	5,800.05	342.84	4,362.13	781.14	255.01	199.17	547.80	27,508.04	100

Table 9. 2024 HFC consumption in Thailand by sector (CO₂-eq tonnes)

Sector	HFC-32	HFC-134a	HFC-152a	R-410A	R-404A	R-454B	R-407C	Other	Total	Share of total (%)
Manufacturing										
Domestic refrigeration	0	622,722	0	0	0	0	0	0	622,722	1.9
Commercial refrigeration	0	65,022	0	0	2,042,212	0	88,160	465,277	2,660,672	8.1
Residential AC	8,018,541	0	0	1,670,000	0	118,599	0	0	9,807,140	30.0
MAC	0	2,027,740	0	0	0	0	0	0	2,027,740	6.2
Commercial AC	911,250	176,462	0	4,175,000	0	0	221,057	0	5,483,769	16.8
PU foam	0	0	0	0	0	0	0	188,768	188,768	0.6
Aerosol	0	286,000	895	0	0	0	0	0	286,895	0.9
Firefighting	0	0	0	0	0	0	0	297,421	297,421	0.9
Solvent	0	0	20,069	0	0	0	0	6,863	26,933	0.1
Other	0	88,960	0	0	0	0	0	0	88,960	0.3
Subtotal manufacturing	8,929,791	3,266,907	20,965	5,845,000	2,042,212	118,599	309,218	958,329	21,491,020	65.8
Refrigeration and air-conditioning servicing*										
Refrigeration subsectors										
Commercial	0	0	0	0	1,021,106	0	44,080	435,195	1,500,382	4.6
Industrial	0	0	21,547	0	0	0	0	30,018	51,566	0.2
Transport	0	0	0	0	0	0	0	2,651	2,651	0.0
Air-conditioning subsectors										
Residential	1,343,642	0	0	3,260,946	0	0	0	0	4,604,588	14.1
Mobile	0	5,027,165	0	0	0	0	0	0	5,027,165	15.4
Subtotal servicing	1,343,642	5,027,165	21,547	3,260,946	1,021,106	0	44,080	467,864	11,186,351	34.2
Total	10,273,433	8,294,072	42,512	9,105,946	3,063,319	118,599	353,298	1,426,194	32,677,371	100

*Consumption of HFCs in the servicing sector is based on best estimates using historical usage patterns and data collected during the field survey for stage I of the KIP.

Manufacturing sectors

Aerosol

64. Thailand has established a significant presence in aerosol product manufacturing, with over 244.3 million units produced across a wide range of applications (household, industrial, personal care, and technical uses), predominantly using hydrocarbons (HCs) as propellants. HFC-134a and HFC-152a are used mainly in specialized applications, particularly pharmaceutical metered-dose inhalers and aviation insecticides.

65. Consumption is relatively limited but growing, with increasing demand for HFC-134a driven by aviation-related uses and a steady growth in the pharmaceutical industry of approximately 5 per cent annually. HFC-152a consumption in solvent applications, which only commenced in 2023, is also increasing and is expected to grow.

Foam manufacturing

66. Polyurethane (PU) foam production is primarily based on cyclopentane as the blowing agent. However, smaller enterprises, which face higher investment constraints, continue to rely on HFC-based alternatives, notably HFC-245fa, which has replaced the earlier use of HFC-365mfc/HFC-227ea.

67. As most foam manufacturers have only recently transitioned from HCFC-141b to HFC-245fa, the high cost of alternative technologies is likely to delay their conversion to HFOs; consequently, HFC demand in the sector is expected to increase in the near term.

68. Thailand has reported consumption of HFCs in imported pre-blended polyols. During the period 2020–2025, consumption of imported pre-blended polyols containing HFC-245fa was reported in 2024 and 2025 at 22.88 mt and 192.50 mt, respectively; no consumption of imported pre-blended polyols containing HFC-365mfc was reported during this period.

Solvent

69. The solvent sector uses several controlled substances for cleaning applications, with HFC-152a and HFC-43-10mee accounting for most HFC use.

70. Consumption trends show growth, particularly for HFC-152a (recently introduced), while HCFC-141b use is expected to cease by 2026, driving further reliance on alternatives.

Domestic refrigeration

71. This sector comprises household refrigerators and freezers, with very high penetration in the market (above 90 per cent). Total production of refrigerators in Thailand is estimated at 7–8 million units annually, of which approximately 2–3 million are sold domestically and the remainder exported. While historically dominated by HFC-134a, the sector is increasingly transitioning to R-600a, which accounted for about 66 per cent of refrigerants used in manufacturing in 2019. As a result, HFC consumption in the sector is declining, and the domestic market is approaching saturation.

Commercial refrigeration

72. The commercial refrigeration sector in Thailand encompasses a wide range of applications, including retail, food service, and cold chain logistics. Equipment types include stand-alone units (plug-in systems similar to domestic refrigerators), condensing units (split systems), and centralized refrigeration systems used in supermarkets, cold storage facilities, and industrial food processing. These systems support applications such as display cabinets, beverage coolers, cold rooms, walk-in chillers and freezers, as well as refrigerated transport (reefer trucks, containers, and fishing vessels).

73. R-404A is the dominant refrigerant in remote-type systems and is also used in plug-in units alongside R-290. HFC-134a is used in limited quantities in specific applications, such as water dispensers, while HCs (R-600a and R-290) and CO₂ are emerging alternatives in some applications.

74. The rapid expansion of retail chains, convenience stores, and the food processing industry has led to increased demand for refrigeration equipment, resulting in a significant increase in R-404A consumption, particularly in remote-type systems. At the same time, there is a gradual transition toward alternative refrigerants, including HCs (e.g., R-290 and R-600a) and CO₂ systems. Under decision 78/3(g), a

conversion project at Pattana Intercool Co. Ltd. (from HFC-134a to R-290 and R-600a) was approved at the 82nd meeting and completed in December 2021. There are other similar industry initiatives for conversion from HFCs to HCs; however, adoption remains challenging for smaller manufacturers, due to cost, safety considerations, and limited technical capacity.

Residential air-conditioning

75. This sector includes small split-type and self-contained AC units and is the largest consumer of HFCs. The cooling capacity for these units ranges from 9,000 BTU/hour (2.638 kW) up to approximately 50,000 BTU/hour (14.65 kW). HFC-32 and R-410A are the dominant refrigerants, with increasing adoption of R-454B in some export markets.

76. Thailand is a major producer of residential air conditioners, manufacturing over 15-16 million units annually, of which approximately 10-12 percent are sold domestically and the remainder exported to international markets. Refrigerant consumption continues to grow with production volumes, although there is a shift toward lower-global-warming-potential (GWP) refrigerants such as HFC-32.

Light commercial air-conditioning

77. This sector comprises larger split-type systems with a cooling capacity above 52,000 BTU/hour, packaged AC units, and variable refrigerant volume (VRV)/variable refrigerant flow (VRF) systems. The main refrigerants are R-410A, HFC-32, and R-407C.

78. As the use of HFC-32 in AC units with a cooling capacity above 52,000 BTU/hour is restricted in tall buildings in Thailand, such units are produced primarily for export, with limited application in the domestic market. Consumption of these three refrigerants has increased significantly, reflecting expanding demand for commercial cooling applications. Consumption of R-454B is also expected to increase.

Mobile air-conditioning

79. MAC systems are used in cars, buses, and trucks, serving a large vehicle fleet and a strong automotive manufacturing sector, with annual production exceeding 2 million units (about 50 per cent sold domestically) and approximately 17 million air-conditioned vehicles in operation (as of April 2020). HFC-134a is the predominant refrigerant, with limited use of HFO-1234yf in imported luxury vehicles and some exported vehicles and trucks.

80. Consumption is stable but expected to grow moderately with vehicle production, while gradual transition to lower-GWP refrigerants is emerging.

Chillers

81. Chillers are used in large buildings and industrial facilities. HFC-134a is the dominant refrigerant, with limited remaining use of HCFC-123. Chillers using HFO refrigerants have recently been introduced in Thailand; however, their uptake remains limited due to the relatively high cost of these refrigerants.

Fire fighting

82. Thailand's fire-protection sector comprises fixed systems and portable fire extinguishers. Fixed systems are used to protect buildings, industrial facilities, and vehicles and include water sprinklers, high-pressure water mist, foam and inert gases, and HFC-based total-flooding agents. HFC-227ea (FM-200) is the predominant agent in fixed-systems, particularly in data centres, airports and petrochemical facilities, while HFC-125, HFC-236fa and HFC-134a, together with declining HCFC-123, are used in portable equipment. In 2024, consumption of HFC-236fa and HFC-227ea was reported in the sector.

83. Manufacturing and refilling activities are very limited. HFC-227ea is imported and supplied by a small number of enterprises, with Anti-Fire Engineering as the sole supplier of FM-200, while HFC-236fa is imported by only two companies for exclusive use in their own portable extinguisher production. Servicing activities consist primarily of cylinder testing, recharge and agent top-up carried out by equipment suppliers themselves. No detailed information is available on the number of servicing workshops or technicians.

84. The Government has confirmed that the phase-out of HFCs in firefighting applications is not a priority under stage I of the KIP, given the small and declining consumptions levels. However, it will continue to monitor demand closely, as the rapid growth of data centres in Thailand could lead to renewed demand for HFC-227ea-based fixed systems.

Refrigeration and air-conditioning servicing sector

85. There are more over 60,000 technicians and 20,000 workshops consuming HFCs in Thailand. Training is mainly delivered through the Department of Skill Development (DSD) and the Office of the Vocational Education Commission (OVEC).

Domestic, commercial, industrial and transport refrigeration servicing

86. Servicing demand in refrigeration is driven by an installed base covering over 90 per cent of households (primarily refrigerators using R-600a and HFC-134a), approximately 244,000 stand-alone commercial units, around 14,400 condensing units and refrigeration systems used in 146 centralized supermarket systems, in addition to cold-chain, transport and ice-making installations. The dominant servicing refrigerants are R-404A, followed by HFC-134a and R-507A; HFC-23 is used in very small quantities, mainly for very low-temperature medical refrigeration. Servicing demand is expected to grow as installed equipment ages and will continue until such equipment is replaced with alternatives.

87. Alternatives entering the field are predominantly flammable (R-290, R-600a), high-pressure (R-744/CO₂ transcritical used in supermarkets and convenience stores) or, in the case of ammonia (R-717) used in large industrial plants, both toxic and high-pressure. The KIP explicitly notes that nearly all medium- and low-GWP alternatives are flammable, and R-744 is the only widely available non-flammable low-GWP option, albeit operating at very high pressure.

Residential and commercial air-conditioning servicing

88. Thailand is the world's second-largest manufacturer of split-type air conditioners with a very large installed base. Servicing consumes the largest share of national HFC consumption (approximately 37 per cent of total HFC imports), dominated by HFC-32. The share of R-410A is declining, while HFC-134a continues to be used in chillers, packaged and commercial systems; smaller volumes of R-407C, R-407F, R-448A, R-449A, R-454B and R-513A are also used. The share of servicing consumption is expected to increase further as the large fleet of HFC-32 equipment installed over the past decade ages.

89. Most low-GWP alternatives being deployed are A2L (mildly flammable), including HFC-32, R-454B, R-452B, R-454C, and R-455A. Some chiller retrofits use HFO-1234ze. R-290 (propane, A3—highly flammable) is being trialled in small AC systems but remains restricted by current building codes for installation in tall buildings above 52,000 BTU/hour. A stage-I KIP risk-assessment study will support amendments to the Building Control Act to allow the use of mildly flammable refrigerants in larger systems in tall buildings.

Mobile air-conditioning servicing

90. As noted earlier, Thailand has more than 17 million registered vehicles equipped with MAC, virtually all charged with HFC-134a (the country's single largest HFC-134a servicing line). Annual vehicle production exceeds 2 million units, while HFO-1234yf use is limited to luxury imports and a small number of export-bound vehicles. The Government will consider banning HFC-134a in MAC applications by 2035 under a subsequent stage of the KIP.

91. Alternatives for MAC servicing include HFO-1234yf (A2L, mildly flammable, with higher operating pressure than HFC-134a) and CO₂ (R-744, very high pressure). There are no widely used toxic alternative in this sector; however, HFO-1234yf cost and the redesign requirements for small servicing shops are recognized as key constraints.

IV. Stage I of the Kigali HFC implementation plan as submitted

Institutional, policy and regulatory framework

92. The implementation of Montreal Protocol activities is coordinated by the Ministry of Industry, with the Department of Industrial Works (DIW) serving as the principal executing agency. Within DIW, the NOU, within the Hazardous Substances Management Division, is responsible for national coordination, policy development, allocation of import quotas, operation of the licensing system, and the monitoring, verification, and reporting of controlled substances.

93. The NOU is supported by a dedicated project management unit (PMU), which oversees the implementation of activities financed by the Multilateral Fund. The Customs Department enforces regulations and border controls and verifies imports and exports against licenses and quotas through an online declaration system. Other key institutions include the Ministry of Finance, which serves as the national focal point for Multilateral Fund financial agreements, and the Ministry of Natural Resources and Environment (notably the Department of Climate Change and Environment and the Thailand Greenhouse Gas Management Organization) which ensure alignment between HFC phase-down measures and national climate change policies and greenhouse gas inventories. The Department of Alternative Energy Development and Efficiency (DEDE), involved in energy-efficiency activities, also support the implementation of project activities, as relevant.

94. The regulation of ozone-depleting substances and HFCs is primarily governed by the Hazardous Substance Act B.E. 2535 (1992) and the 1992 Factory Act. HFCs have been classified as type III hazardous substances since 2013, requiring mandatory import and export licensing. An HFC import quota system became operational in 2024, using the framework previously applied to HCFCs, with annual quotas established by the NOU and allocated to registered importers.

95. Thailand has well-established minimum energy performance standards (MEPS) and energy-efficiency labelling schemes relevant to cooling-sector transitions. Mandatory MEPS for room air conditioners and domestic refrigerators are developed and enforced by the Thai Industrial Standards Institute, with the most recent air-conditioner standard (TIS 2134–2022) based on the Cooling Seasonal Performance Factor (CSPF) and Energy Efficiency Ratio (EER) metrics. Complementing MEPS, the Electricity Generating Authority of Thailand (EGAT) operates the voluntary “Label No. 5” programme, which covers air conditioners, refrigerators, and other appliances and was upgraded in 2024 to a multi-star system reflecting higher efficiency levels, particularly for inverter technologies. Together, these standards and labelling systems provide a strong policy foundation for integrating energy-efficiency improvements alongside the HFC phase-down.

Phase-down strategy for stage I of the Kigali HFC implementation plan

Overarching strategy

96. The primary objective of stage I of the KIP is to ensure that Thailand's HFC consumption remains within established thresholds during the initial compliance period. Planned activities include a combination of technical assistance and capacity-building to promote good servicing practices, primarily in MAC and other refrigeration applications, the safe adoption of low-/lower-GWP alternatives, the faster uptake of lower-GWP refrigerant-based energy-efficient equipment, the update of safety regulations to facilitate the adoption of lower-GWP AC technologies, and product development of an innovative energy-efficient AC equipment. This strategy is expected to support the reduction of HFC consumption to 80 per cent of the baseline by 2029 and maintaining this level until 2034. Over this eight-year period, implementation will be closely coordinated with the energy-efficiency revolving-fund end-user project funded by the Multilateral Fund,⁸ as well as stage III of the HPMP, which primarily addresses HCFC phase-out in servicing applications.

Proposed reductions

97. Based on inputs received from industry stakeholders during the KIP survey and technology trends, the Government of Thailand forecasted HFC consumption in a business-as-usual scenario using a compounded growth rate of 4.94 per cent during the period 2026 to 2034. Table 10 presents the Montreal Protocol limits, HFC consumption forecast and the proposed reductions for that period.

Table 10. HFC consumption forecast under the unconstrained scenario, Montreal Protocol limits, and proposed HFC reductions under stage I (million CO₂-eq tonnes)

	2026	2027	2028	2029	2030	2031	2032	2033	2034
HFC consumption forecast at a compounded growth rate of 4.94%*	35.18	37.82	40.68	42.29	43.99	45.79	47.67	49.65	51.73
Montreal Protocol HFC consumption limits	59.27	59.27	59.27	53.34	53.34	53.34	53.34	53.34	53.34
HFC consumption levels proposed under the KIP	59.27	59.27	59.27	47.42	47.42	47.42	47.42	47.42	47.42
Proposed reductions from the HFC consumption baseline (%)	0	0	0	20	20	20	20	20	20

* Calculated based on estimated increases in consumption of different HFCs across various applications, with high growth projected up to 2028, followed by a decline during the period 2029–2034.

Proposed activities

Manufacturing sector

98. Stage I of the KIP for Thailand includes investment activities in the manufacturing sector to support the conversion of six enterprises from R-410A to HFC-32 in large AC equipment with a cooling capacity of 80,000 BTU/hour and above. The total funding requested amounts to US \$1,007,808 and would primarily support product redesign, prototype development and testing, manufacturing facility conversion, and the training of in-house service technicians. A proposed activity in the servicing sector on the risk assessment of A2L refrigerants in high-rise buildings will complement this conversion.

99. The proposed project costs for the six enterprises, as submitted, are presented in table 11.

⁸ See document UNEP/OzL.Pro/ExCom/98/55

Table 11. Manufacturing sector costs in stage I of the KIP for Thailand as submitted

Particulars	Average HFC consumption (2022–2024) (kg)	Incremental capital cost (US \$)	Incremental operating cost (US \$)	Total (US \$)	Funding requested (US \$)
Bitwise*	18,393	226,084	106,302	332,386	275,897
Eminent Air*	4,113	203,152	17,999	221,151	61,694
PPJ Engineering*	24,894	324,828	446,242	771,070	373,403
Siam Temp	1,085	218,614	28,610	247,224	21,476
Supreme CNB Corporation*	3,731	567,974	22,214	590,188	55,963
Unifab Equipment*	14,625	474,122	115,538	589,660	219,375
Total	66,841	2,014,774	736,905	2,751,679	1,007,808

*These companies were funded under stage I of the HPMP to convert from HCFC-22 to HFC-32 in small AC equipment.

Servicing sector

100. In the servicing sector, stage I of the KIP proposes a range of activities, including capacity-building on the use of alternatives and the promotion of good servicing practices in MAC, refrigeration and AC applications through training programmes, provision of equipment to training centres, and certification of technicians. It also includes an end-user incentive programme to promote the replacement of high-GWP equipment

101. In addition, the servicing sector includes a MAC policy development component aimed at developing energy-efficiency standards (high energy performance standards (HEPS) and MEPS) for MAC systems, a major source of HFC-134a consumption. This component will support the development of regulations and standards promoting low-GWP refrigerants and high-efficiency technologies, thereby reducing energy use and emissions while preventing inefficient equipment from entering the market. A comprehensive risk-assessment component on flammable refrigerants is also proposed to complement the manufacturing conversion activities and facilitate the safe use of mildly flammable low-GWP refrigerants (e.g., HFC-32) in large AC and refrigeration systems, particularly in high-rise buildings and commercial applications. Implemented jointly by DIW and Department of Public Works and Town and Country Planning, this component will inform regulatory updates through technical analysis, safety testing, and stakeholder consultations, resulting in draft safety standards and policy recommendations to support technicians that use A2L refrigerant-based equipment. In addition, a technical assistance activity will support product development to integrate heat-recovery capabilities into conventional AC systems, thereby enhancing energy efficiency.

102. Activities proposed for implementation in the servicing sector under stage I and in the first tranche and their cost breakdown are presented in table 12.

Table 12. Servicing sector activities and their costs in stage I and in the first tranche of stage I of the KIP for Thailand, as submitted

Activity	Cost (US \$)	
	Stage I	First tranche
1. Policy and regulatory actions		
1.1. Prohibit use of HFCs in manufacturing of domestic refrigerators (by 2030);	Co-financing from Government	n/a
1.2. Prohibit use of HFCs in stand alone commercial refrigeration manufacturing (by 2030);		
1.3. Prohibit imports of HFC-based domestic and stand-alone commercial refrigeration equipment (by 2030);		
1.4. Establish GWP threshold of 700 for AC equipment (except chillers) on the domestic market (by 2030);		

Activity	Cost (US \$)	
	Stage I	First tranche
1.5. Implement HFC import quota limit (47.42 million CO ₂ -eq tonnes by 2029)		
2. MAC servicing 2.1. Train 1,000 MAC technicians on good servicing practices, including recovery, recycling and reuse of refrigerants, and develop the associated training curriculum (US \$105,000); 2.2. Train 288 trainers through train-the-trainer programmes across 24 centres (US \$115,200); 2.3. Equip 24 centres with 144 sets of training equipment (US \$950,400); 2.4. Provide service tools to 1,000 trained technicians (US \$500,000)	1,670,600	405,320
3. Large air-conditioning systems servicing (VRF/VRV systems) 3.1. Train 2,500 technicians on installation and servicing of large low-GWP AC systems (US \$1,875,000); 3.2. Train 20 instructors through specialized train-the-trainer programmes (US \$12,000); 3.3. Develop curriculum, training materials, and competency testing modules, and conduct competency tests (US \$290,000); 3.4. Equip four regional training centres operated by the DSD and OVEC with VRF AC training units, installation and servicing tools, consumable materials for training (US \$324,000)	2,501,000	126,000
4. Commercial refrigeration servicing (transcritical CO₂ systems) 4.1. Develop training materials on the adoption of transcritical CO ₂ systems (US \$3,000); 4.2. Train 800 technicians on transcritical CO ₂ refrigeration servicing (US \$600,000); 4.3. Train 20 master trainers through train-the-trainer programmes (US \$25,000); 4.4. Equip four training centres with CO ₂ training systems (transcritical CO ₂ refrigeration systems and chilled rooms with thermal insulation) (US \$308,000)	936,000	0
5. Plug-in commercial refrigeration (safety and servicing) <i>(a) Technical training for small commercial refrigerator manufacturers (US \$67,500)</i> 5.1. Provide safety training to 25 small manufacturers on the safe handling of HCs and implementation of measures for occupational health and safety (US \$62,500); 5.2. Development of training materials on the safe handling of HCs (US \$5,000); <i>(b) Training for service technicians installing and maintaining equipment (US \$642,800)</i> 5.3. Train 480 service technicians in the safe installation and maintenance of HC-based equipment, including hazard detection and mitigation (US \$360,000); 5.4. Train 20 trainers through train-the-trainer programmes (US \$4,000) 5.5. Develop training standards, materials, and competency testing modules (US \$8,000); 5.6. Equip four training centres of the DSD and OVEC with commercial refrigeration training rigs; recovery and charging equipment; leak detection and safety devices; ventilation and sensors; plug-in R-290 cabinets; spare compressors; and consumable materials for training (US \$120,800); 5.7. Conduct competency test (US \$100,000); 5.8. Procure service equipment tools for certified technicians (US \$50,000)	710,300	150,300

Activity	Cost (US \$)	
	Stage I	First tranche
6. End-user incentive programme Provide financial incentives for the replacement of approximately 13,000 R-410A-based residential air conditioners with cooling capacities of 12,000–18,000 BTU/hour with HFC-32-based equipment (cash coupons of approximately US \$150 per unit, representing around 30 per cent of the cost)	2,000,000	1,000,000
7. MAC policy development 7.1. Personnel cost (project manager, mechanical and electrical engineers, statistician, standard specialist, market analyst, and support staff) for project management, technical support and analysis, and reporting (US \$43,000); 7.2. Consultation meetings of academic working group, public consultation, and field surveys for development of standards (US \$22,000); 7.3. Conduct energy-efficiency performance tests (US \$185,000)	250,000	175,000
8. Risk assessment of flammable refrigerants 8.1. Personnel cost (project manager, mechanical and electrical engineers, standard specialist, and support staff) for project management, technical support and analysis, and reporting (US \$35,000); 8.2. Consultation meetings with the DPT, DIW, academic and professional working group, target group representatives, and field survey for finalization of safety standards (US \$ 25,000); 8.3. Conduct safety test (US \$10,000)	70,000	70,000
9. Technical assistance for product development – heat-recovery air conditioners 9.1. Product design and development (US \$37,400); 9.2. Conduct performance testing (US \$75,000); 9.3. Disseminate results and transfer technology to industry and other relevant market stakeholders (US \$90,000)	202,400	141,680
10. PMU activities (see paragraphs 103 and 104)	1,112,715	347,724
Total	9,453,015	2,416,024

Project implementation, coordination and monitoring

103. Two PMUs will jointly oversee the implementation of the KIP over an eight-year period, with a total budget of US \$1,112,715. In close coordination with the NOU and the World Bank, the DIW-PMU is responsible for overall project management and coordination, including training and capacity-building activities, support to regulatory implementation (e.g., quotas and licensing), monitoring and reporting of progress, stakeholder outreach, technical and safety reviews, and financial management and auditing of the KIP. The estimated cost for the DIW-PMU amounts to US \$764,000 over eight years, comprising US \$536,000 for the DIW-PMU personnel; US \$124,000 for three specialized consultancy services covering annual HFC consumption verification, financial audits of training-centre expenditures, and audits of the overall project account; US \$40,000 for travel; and US \$64,000 for equipment and consumables.

104. The costs associated with the PMU under the Government Savings Bank (GSB), calculated at 2 per cent of the project value, amount to US \$348,715. Of this total, US \$20,156 relates to the manufacturing conversion subprojects valued at US \$1,007,808, while US \$328,559 relates to the parallel energy-efficiency improvement project submitted under decision 94/60, valued at US \$16,427,972, as submitted.

Total cost of stage I of the Kigali HFC implementation plan

105. The budget for stage I has been proposed at US \$10,460,823. The costs of activities in the refrigeration servicing sector have been proposed in line with decision 92/37.

106. The proposed activities and cost of stage I of the KIP are summarized in table 13.

Table 13. Proposed cost of activities to be implemented in stage I and in the first tranche of stage I of the KIP for Thailand (US \$)

Activity	Cost (US \$)	
	Stage	First tranche
Manufacturing sector	1,007,808	705,466
Servicing sector	8,340,300	2,068,300
PMU for stage I of the KIP and energy-efficiency improvement project (decision 94/60)	1,112,715	347,724
Total	10,460,823	3,121,490

Implementation plan for the first tranche

107. The first funding tranche of stage I of the KIP was submitted in the total amount of US \$3,121,490, as shown in table 13 above, to be implemented between July 2026 and December 2028. Detailed information on the activities to be implemented under the first tranche, including adjustments and level of funds as agreed, are presented in paragraph 134 below.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

V. Comments

Overarching strategy

108. In line with decision 92/44, the Government of Thailand has expressed strong commitment to supporting reductions in HFC consumption in advance of the Montreal Protocol targets.⁹

HFC phase-down targets

109. The Secretariat noted that Thailand's HFC consumption during the baseline years, after adjustments for abnormal imports in 2022, is estimated at approximately 34–35 million CO₂-eq tonnes. Clarification was sought on how this adjusted baseline had been taken into account in determining Thailand's limits under the Montreal Protocol. The World Bank explained that refrigerant consumption in the AC and refrigeration sectors is expected to continue increasing, driven by growing cooling demand across all sectors, with the highest growth expected in the AC sector. Under a business-as-usual scenario, only limited transition to lower-GWP alternatives is anticipated based on historical trends, and in some applications such transition could slow or reverse in the absence of appropriate safety-related policy interventions. In addition, continued expansion in air-conditioner demand, combined with servicing requirements for HFC-32 equipment installed over the past decade and the limited availability of lower-GWP alternatives for certain applications, is expected to contribute to an overall increase in HFC demand. Taking these factors into account, and following consultations with industry and other relevant stakeholders, the targets presented in table 10 were determined.

⁹ As per the letter of 17 March 2026 from the Department of Industrial Works of the Ministry of Industry of Thailand to the World Bank.

Institutional, policy and regulatory framework

HFC licensing and quota system

110. In line with decision 87/50(g), the World Bank has confirmed that Thailand has an established and enforceable system of licensing and quotas for monitoring HFC imports/exports in place. The HFC quota for 2026 was issued at 53.34 million CO₂-eq tonnes.

111. The Secretariat held detailed discussions with the World Bank regarding the potential to reduce maximum allowable HFC consumption in 2027 and 2028 below 59.27 million CO₂-eq tonnes through national control measures. The World Bank explained that, based on an agreement with industry, Thailand sets its annual HFC import quota at 90 per cent of the maximum allowable consumption under the Kigali Amendment. Accordingly, with a baseline of 59.27 million CO₂-eq tonnes, an import quota of 53.343 million CO₂-eq tonnes was allocated to importers at the beginning of the year, with the remaining 10 per cent retained as a reserve to address potential illegal trade.

112. The World Bank noted that, in the coming years, a shift from HCFCs to HFCs is expected in certain applications to service existing equipment. This, combined with projected growth in AC manufacturing and in other sectors such as aerosols, foams and firefighting, may contribute to increased HFC consumption. The Government will continue to monitor the situation closely and issue quotas accordingly, with a view to curtailing HFC consumption without unduly affecting the industry.

Prohibition of HFC-based refrigeration and air-conditioning equipment

113. With respect to domestic refrigeration, the World Bank explained that Thailand primarily manufactures small- and medium-sized refrigerators, most of which already use isobutane as a refrigerant. The proposed regulation to prohibit the manufacture and import of domestic refrigerators and stand-alone commercial refrigeration equipment using HFCs by 1 January 2030 is intended to ensure the permanent phase-out of HFCs in these applications for the domestic market.

114. For AC equipment, excluding chillers, the Government plans to prohibit the manufacture and import of equipment using refrigerants with a GWP above 700 by the same date. For other applications, prohibitions and related controls will be considered following technical reviews of feasible and sustainable alternatives and consultations with industry.

115. The Secretariat discussed the possibility of advancing the proposed timelines for prohibiting the manufacture of HFC-based equipment in the above applications. The World Bank indicated that, should the project be approved at the 98th meeting, approximately 15 to 18 months would be required to finalize administrative arrangements and commence implementation. Additional time would be required for stakeholder consultations, negotiations and enforcement.

Equipment manufactured for export markets

116. The Secretariat sought clarification on whether the proposed regulations would also prohibit the manufacture of HFC-based equipment intended for export markets. The World Bank explained that manufacturers are expected to transition to low- or lower-GWP technologies when the export market is ready. At present, however, applying a universal ban covering both domestic and export markets could place Thailand at a disadvantage in export markets, given the uneven and gradual transition of demand across countries and regions. The proposed policy approach is therefore considered flexible and pragmatic. It was also noted that experience in Thailand has shown that maintaining multiple product lines may not be cost-effective.

Use of commercial air-conditioning equipment using mildly flammable refrigerants

117. In relation to commercial AC manufacturing conversion projects, the Secretariat noted that existing regulations in Thailand do not allow the installation of equipment using mildly flammable refrigerants in high-rise buildings and requested clarification on the timeline for addressing this constraint. The World Bank explained that the KIP includes engagement with the Ministry of Interior to address this regulatory barrier and facilitate future approval of such equipment in high-rise buildings. This process is expected to be completed by December 2029, following completion of necessary processes and administrative approvals.

Reporting of HFC data

118. The Secretariat requested clarification regarding the absence of reported HFC data for 2023 to the Ozone Secretariat. The World Bank clarified that Thailand ratified the Kigali Amendment in April 2024 and, in accordance with decisions of the Meeting of the Parties, is not required to report HFC consumption data for 2023. Nevertheless, all relevant data required for the analysis of the KIP, including substance-specific and sectoral information for the period 2020–2024, has been provided, together with relevant analysis of consumption trends.

Technical and cost-related issues

Conversion projects for commercial air-conditioning

119. The Secretariat discussed the costs associated with the enterprises manufacturing commercial AC equipment, noting that the enterprises' cooling capacities exceeded 80,000 BTU/hour.

120. With respect to data on HFC consumption for 2025, the World Bank explained that the survey and data collection were completed in early 2025; therefore, consumption data are available only for the period 2022 to 2024.

121. Following the discussions and taking into account the need for product redesign to accommodate A2L refrigerants, as well as modifications to manufacturing facilities for the safe handling of these refrigerants, the costs were agreed at the levels presented in table 14, in accordance with the cost guidelines for commercial AC applications approved in decision 95/86.

Table 14. Agreed costs for the manufacturing sector for stage I of the KIP for Thailand

Particulars	Average consumption (2022–2024) (kg)	Funding as submitted (US \$)	Funding as agreed (US \$)
Bitwise	18,393	275,897	275,895
Eminent Air	4,113	61,694	61,694
PPJ Engineering	24,894	373,403	373,410
Siam Temp	1,085	21,476	21,476
Supreme CNB Corporation	3,731	55,963	55,965
Unifab Equipment	14,625	219,375	219,375
Total	66,841	1,007,808	1,007,815

*Funding was requested at a cost-effectiveness value applicable for small- and medium-sized enterprises (SMEs) i.e., 1.32 times US \$15/kg (decision 95/86 (d)).

Service sector

122. With regard to private sector participation in MAC servicing, the World Bank indicated that a training curriculum will be developed by the DSD in collaboration with the Thai Automotive Industry Association under the Federation of Thai Industry. The DSD and the NOU will jointly establish criteria for

engaging MAC service workshops, while coordination with MAC manufacturers will be undertaken to maximise the outreach of training on good servicing practices.

123. Regarding technical assistance for small refrigeration equipment manufacturers to adopt HC-based technologies, the World Bank noted that support will focus on the safe design of equipment using flammable refrigerants and preventing the reintroduction of HFCs into the market. Such training activities are expected to be conducted by local compressor manufacturers with established business relationships with small equipment producers, thereby facilitating faster adoption of HC-based technologies.

124. On the feasibility of use of transcritical CO₂-based chillers, the World Bank explained that such systems can operate under Thailand's high-ambient temperature conditions, although at reduced efficiency levels. Equipment optimization can mitigate these constraints, and training support for technicians is considered essential to increase the availability of specialized personnel for installation and maintenance and to encourage wider adoption of these systems.

125. Regarding regulations for servicing large-capacity refrigeration and air-conditioning (RAC) systems, the World Bank indicated that, as a first step, voluntary certification of service technicians will be introduced by the DSD. Members of the Thai Refrigeration Association is expected to require certified technicians for their projects, with this approach to be reviewed during preparation of stage II of the KIP.

126. Concerning the proposed end-user incentive scheme for AC equipment, the Secretariat sought clarification given the ongoing market transition away from R-410A and considering the high availability of lower-GWP alternatives. The World Bank explained that this incentive programme is intended to replace R-410A-based residential air conditioners installed prior to 2011, which exhibit high leakage rates and lower energy performance. The proposed activity is expected to accelerate replacement and will be complemented with support under the energy-efficiency revolving-fund¹⁰ for low-cost loans if consumers opt for higher energy-efficient (EGAT level 5 – three star) HFC-32-based air-conditioners.

127. Regarding the project on heat recovery from AC systems, the World Bank explained that funding will support product development aimed at incorporating heat recovery capabilities into conventional AC systems with cooling capacities of 12,000, 18,000, 24,000, and 36,000 BTU/hour. The improved design is expected to reduce the size of condensing coil and refrigerant charge; the hot water resulting from the heat exchange from the condenser would be available for the end-user for household use, thereby reducing energy use, potentially reducing refrigerant charge and both direct and indirect CO₂ emissions. The results from this project would be disseminated to relevant stakeholders within Thailand and in countries with similar climatic conditions. The Secretariat notes that the project presents an opportunity for innovative energy-efficient technology. The World Bank further explained that the proposed design is based on plate-type heat exchangers for heat transfer and would not infringe existing patents.

128. The Secretariat also discussed the MAC policy development component, noting that MAC sector activities were expected to be implemented during stage II (around 2035). The World Bank emphasized the importance of technical information exchange and consultations on key policy and technology choice to prepare the industry for conversion. The Thai Automotive Industry Association, the Thai Industrial Standards Institute, DIW and DEDE are expected to be involved in the proposed project. Following consultations, it was agreed that this activity would be redesigned and integrated with MAC servicing activities, focusing on technical information outreach and stakeholder consultations on developments of MAC technology options and experiences with HFC-free alternative technologies (e.g., HFO-1234yf other low-GWP options). Where feasible, this could also include possible retrofit of existing HFC-134a-based MAC systems with alternative refrigerants, thereby contributing to the reduction in HFC-134a consumption in the sector.

¹⁰ See document UNEP/OzL.Pro/ExCom/98/55

Project management unit

129. The revised PMU costs were agreed at US \$784,155, excluding US \$328,559 for technical assistance to six manufacturing enterprises on energy efficiency. Further details are provided under the energy-efficiency project.

130. Based on the above considerations, the costs presented in table 15 were agreed. These activities would not only contribute to the planned reduction in HFC consumption but also establish a strong foundation for future activities under stage II of the KIP.

Table 15. Agreed costs for stage I of the KIP (US \$)

Particulars	As submitted	As agreed
Servicing sector		
Policy and regulatory actions	Co-financing from Government	Co-financing from Government
MAC servicing	1,670,600	1,920,600*
Large AC systems servicing	2,501,000	2,501,000
Commercial refrigeration servicing (transcritical CO ₂ systems)	936,000	936,000
Support to commercial refrigeration SMEs for technology transfer	67,500	67,500
Support for commercial refrigeration technicians	642,800	642,800
End-user incentive programme	2,000,000	2,000,000
MAC policy development	250,000	0
Risk assessment of flammable refrigerants	70,000	70,000
Technical assistance for development of heat recovery air conditioners	202,400	202,400
Subtotal – servicing	8,340,300	8,340,300
Manufacturing sector	1,007,808	1,007,815
Subtotal – servicing and manufacturing	9,348,108	9,348,115
PMU for DIW	764,000	764,000
PMU for GSB for stage I of the KIP	20,156	20,156
Subtotal – PMU costs	784,156	784,155
Grand total	10,132,264	10,132,270

*Revised MAC sector service activities to support technology information analysis and consultations with the industry for future HFC phase-down in the sector.

Calculation of reductions from the starting point in HFC consumption

131. Based on the cost of activities in the servicing sector, agreed at US \$8,340,300, reductions from the remaining HFC consumption eligible for funding in the servicing sector amount to 2,691,284 CO₂-eq tonnes, as summarized in table 16.¹¹ Taking into account the country's HFC consumption during the baseline year (discussed in paragraph 109), the Government of Thailand has agreed to reduce its 2029 HFC consumption to 47,416,761 CO₂-eq tonnes, representing 20 per cent of the country's HFC baseline for compliance.

Table 16. Agreed costs and reductions from HFC consumption eligible for funding and final target

Servicing sector		
Average HFC consumption in the servicing sector in baseline years	Mt	8,652.09
	CO ₂ -eq tonnes	14,238,650
Average GWP of all HFCs consumed in the sector		1,646
Agreed funding	US \$	8,340,300
Agreed cost-effectiveness threshold	US \$/kg	5.10

¹¹ Calculated in line with the methodology presented in annex I of document UNEP/OzL.Pro/ExCom/92/46.

Servicing sector		
Reductions in the servicing sector	mt	1,635.35
	CO ₂ -eq tonnes	2,691,284
Reductions from all sectors		
Established HFC consumption baseline	CO ₂ -eq tonnes	59,270,951
Reductions achieved through conversions in the manufacturing sector* (excluding reductions achieved under the investment project approved through decision 82/80)	CO ₂ -eq tonnes	139,530
Reductions achieved through activities in the servicing sector	CO ₂ -eq tonnes	2,691,284
Target		
2029 target (the Government of Thailand proposed to achieve 20 per cent reduction in 2029). This is equivalent to 9,023,376 CO ₂ -eq tonnes, for which no funding was requested)	CO ₂ -eq tonnes	47,416,761

* Phase-in of 31,582 CO₂-eq tonnes of HFC-32 is expected from the conversions.

Total project cost

132. At a total cost of US \$10,132,270, stage I of the KIP for Thailand will result in a reduction of 2,830,814 CO₂-eq tonnes from the country's HFC consumption eligible for funding, as summarized in table 17. At the 82nd meeting, the Executive Committee approved the project for the conversion from HFCs to propane (R-290) and isobutane (R-600a) in the manufacture of commercial refrigeration appliances at Pattana Intercool Co. Ltd.¹² Combined with the reductions to be achieved in stage I of the KIP, total reductions from the country's remaining HFC consumption eligible for funding amount to 2,843,369 CO₂-eq tonnes.

Table 17. Agreed cost of activities to be implemented during stage I of the KIP in Thailand

Sector	HFC	Phase-out to be achieved				Cost	CE*	
		mt		CO ₂ -eq tonnes		US \$	US \$/kg	US \$/ CO ₂ -eq tonnes
		Funded	Non-funded	Funded	Non-funded			
Manufacturing	R-410A	66.84	0	139,530	0	1,007,815	15.08	7.22
Project approved under decision 78/3(g) (decision 82/80)	HFC-134a	8.78	0	12,555	0	183,514	20.90	14.61
Servicing	Multiple HFCs	1,635.35	0	2,691,284	0	8,340,300	5.10	3.10
PMU	n/a	n/a		n/a		784,155		
Total		1,710.97		2,843,369		10,315,784	6.03	3.63

*CE=cost-effectiveness

133. Stage I of the KIP will be implemented in four tranches.

Implementation plan for the first tranche of the Kigali HFC implementation plan

134. The agreed plan of action, amounting to US \$3,121,489, will include the following activities:

- (a) *Manufacturing sector (US \$705,466)*: Initiate first two payments under six enterprises' conversion subgrants;
- (b) *MAC servicing (US \$580,320)*: Develop training curriculum and conduct train-the-trainers activities for good practices in MAC service (US \$120,200); develop specifications for

¹² To achieve HFC reductions of 12,555 CO₂-eq tonnes (decision 82/80).

training equipment for the 24 training centres and initiate the first payment for procurement (US \$285,120); assess technology options, consult with the MAC industry and national stakeholders, and conduct outreach on MAC-related support (US \$175,000);

- (c) *Large AC systems servicing (US \$126,000)*: Develop curriculum, training manuals, and competency testing module (US \$40,000); engage experts for 20 participants in train-the-trainer workshops (US \$12,000); initiate procurement activities for VRF AC training units and tools for installation and servicing (US \$74,000);
- (d) *Plug-in commercial refrigeration (US \$150,300)*: Conduct technical training for small plug-in commercial refrigeration manufacturers (US \$67,500); initiate training activities for small commercial refrigeration technicians (US \$12,000); initiate procurement activities for small commercial refrigeration training equipment (US \$70,800);
- (e) *End-user incentive programme (US \$1,000,000)*: Provide financial incentives for the replacement of approximately 6,500 R-410A-based residential air conditioners;
- (f) *Risk assessment of flammable refrigerants (US \$70,000)*;
- (g) *Technical assistance for product development – heat recovery air conditioners: (US \$141,680)*: Initiate first payments for the implementation of the heat-recovery technology work; and
- (h) *Project monitoring (US \$347,723)* with the following cost breakdown: Staff (US \$262,364); consultant (US \$38,750); travel (US \$12,500); operating expenses (US \$20,000); and GSB-PMU fees (US \$14,109).

Co-financing

135. The estimated co-financing includes additional costs to be incurred by the six enterprises for the implementation of the conversion project, as well as in-kind contributions from the Government of Thailand for policy and regulatory measures. Based on the submitted project costs, total co-financing is expected to exceed US \$1.75 million, primarily associated with incremental project costs.

2026–2028 business plan of the Multilateral Fund

136. The World Bank is requesting US \$10,132,270, plus agency support costs, for the implementation of stage I of the KIP for Thailand. The total value of US \$7,223,697, including agency support costs, requested for the period of 2026–2028, is US \$2,406,303 below the amount in the business plan.

Gender policy implementation

137. In line with decisions 84/92(d) and 90/48(c), the Government is taking several measures to implement the Multilateral Fund's operational policy on gender mainstreaming during stage I of the KIP. Across all activities, efforts will be made to encourage women's participation and maximize their involvement in project development and implementation. Further details on gender policy implementation are provided in paragraph 47.

Sustainability of the HFC phase-down and assessment of risks

138. The sustainability of the phase-out in the residential AC manufacturing sector will be supported by the planned ban, effective 1 January 2030, on the manufacture and import of equipment with a GWP above 700. The six enterprises participating in the project are expected to complete their conversion prior to the entry into force of the ban. Given Thailand's experience in adopting HFC-32-based air conditioners together

with the anticipated approval of regulations for the safe use of larger-capacity air conditioners using A2L refrigerants, the Secretariat considers the risk to the sustainability of the phase-down in manufacturing to be low. In addition, the sustainable adoption of low-GWP alternatives in refrigeration applications will be supported through assistance to the industry, particularly SMEs manufacturing commercial refrigeration equipment, as well training and technical support for the servicing sector on the safe adoption of such alternatives.

139. SMEs participating in the conversion projects are expected to face greater challenges in implementing conversion projects than larger enterprises, given their limited financial and technical capacity. To address this and mitigate the risk to the sustainability of their conversion, stage I of the KIP includes a dedicated technical assistance programme and training and capacity-building activities in the servicing sector, including measures to strengthen the capacity of RAC technicians to safely handle flammable refrigerants.

Impact on the climate

140. The activities proposed, including the conversion of the six enterprises from R-410A-based refrigerants to HFC-32, efforts to promote alternatives with low GWP, and minimizing refrigerant emission through good servicing practices and refrigerant recovery and reuse, indicate that the implementation of stage I of the KIP will reduce refrigerant emissions in the atmosphere, resulting in climate benefits. A calculation of the impact on the climate of the activities in the KIP indicates that by 2029, Thailand will have reduced its HFC emissions by approximately 11,854,190 CO₂-eq tonnes, calculated as the difference between the HFC baseline for compliance and the 2029 target, assuming that all consumed HFCs would have eventually been emitted.

Draft Agreement

141. A draft Agreement between the Government of Thailand and the Executive Committee for stage I of the KIP is contained in annex II to the present document.

Coordination of activities in the servicing sector under HCFC phase-out and HFC phase-down plans

142. Annex III summarizes the simultaneous implementation of activities under the HPMP and the KIP.

VI. Recommendation

143. The Executive Committee may wish to consider:

- (a) Approving, in principle, stage I of the Kigali HFC implementation plan (KIP) for Thailand for the period 2026–2034 to reduce HFC consumption by 20 per cent of the country's baseline by 2029 and maintaining consumption at least at that level until 2034, in the amount of US \$10,132,270, plus agency support costs of US \$709,259, for the World Bank;
- (b) Noting:
 - (i) The strong commitment of the Government of Thailand to support reductions in HFC consumption in advance of the Montreal Protocol targets;
 - (ii) That the Government would implement a ban, by 1 January 2030, on the manufacture and import of domestic refrigerators using HFCs, stand-alone commercial refrigeration equipment using HFCs, and the manufacture and import of air-conditioning equipment using refrigerants with a global-warming potential (GWP) above 700, excluding chillers;

- (iii) That 2,830,814 CO₂-eq tonnes of HFCs will be deducted from the starting point for sustained aggregate reductions in HFC consumption that will be established on the basis of guidance provided by the Executive Committee taking into account the unfunded reduction of 9,023,376 CO₂-eq tonnes;
 - (iv) That, in line with decision 82/80, an additional 12,555 CO₂-eq tonnes of HFCs will be deducted from the starting point for sustained aggregate reductions in HFC consumption to be established on the basis of guidance provided by the Executive Committee;
 - (v) That, upon completion of the end-user project included in stage I of the KIP, the World Bank will submit a final report on the implementation of this project, including the HFC phase-out and energy-efficiency gains achieved, in line with decision 92/36(g);
- (c) Approving:
- (i) The draft Agreement between the Government of Thailand and the Executive Committee for the reduction in consumption of HFCs in accordance with stage I of the KIP, contained in annex II to the present document; and
 - (ii) The first tranche of stage I of the KIP for Thailand and the corresponding tranche implementation plan, in the amount of US \$3,121,489, plus agency support costs of US \$218,504, for the World Bank.

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

Project to enhance energy efficiency in the manufacturing of air conditioners	World Bank
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PROJECT OBJECTIVE

The project aims to enhance the energy efficiency of six enterprises manufacturing air conditioners to the targeted energy efficiency levels and implement associated policy measures to achieve and sustain the targets
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NATIONAL CO-ORDINATING AGENCY	National ozone unit, Department of Industrial Works, Ministry of Industry
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LATEST ARTICLE 7 DATA (Annex F)	Year: 2024	27,542.35 mt	32,708,003 CO ₂ -eq tonnes
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Particulars	Investment activities	
HFCs used in air-conditioner manufacturing as reported in country programme (CP) implementation report data for 2025	HFC-134a	1,641.00 mt
		2,346,630 CO ₂ -eq tonnes
	HFC-32	13,445.23 mt
		9,075,530 CO ₂ -eq tonnes
	R-407C	2,477.00 mt
		4,393,826 CO ₂ -eq tonnes
	R-410A	2,822.68 mt
		5,892,345 CO ₂ -eq tonnes
	R-454B	683.18 mt
		317,730 CO ₂ -eq tonnes
Project duration (months):	36 months	
Initial amount requested (US \$):	16,427,972	
Final project costs (US \$)	3,878,647	
Implementing agency support cost (US \$):	271,505	
Total cost of project to Multilateral Fund (US \$):	4,150,152	
Energy-efficiency savings* (US \$/kWh/year):	0.0083	
Status of counterpart funding (Y/N):	Y	
Project monitoring milestones included (Y/N):	Y	
Minimum energy performance standards available for the relevant sector (Y/N):	Y	

* For the first year of the project following project completion. Additional benefits will be accrued each subsequent year, based on the operation of equipment manufactured in that and subsequent years.

SECRETARIAT'S RECOMMENDATION	Individual consideration
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PROJECT DESCRIPTION

Background

144. On behalf of the Government of Thailand, 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 manufacture of air conditioners, in the amount of US \$16,427,972, plus agency support costs of US \$1,149,958, as originally submitted.¹³

145. Additionally, investment projects in the AC manufacturing sector are proposed for consideration at the 98th meeting as part of stage I of the Kigali HFC implementation plan (KIP). Support is also proposed for a project under the energy-efficiency revolving fund (EERF), which includes elements targeting end-users, including enabling air-conditioning (AC) equipment suppliers to offer low-cost products to end-users.

Energy-efficiency project

Policy, regulatory and institutional framework

146. Minimum energy performance standards (MEPS) in Thailand are established by the Thailand Industrial Standards Institute (TISI), operating under the Ministry of Industry. As the designated standards authority, TISI formulates and periodically updates MEPS across a range of industrial products, with particular emphasis on air conditioners and refrigerators due to their significant contribution to energy consumption in both residential and commercial sectors.

147. To keep pace with technological progress and rising expectations for energy efficiency, TISI introduced a major revision of air-conditioner MEPS in 2022, formalized as standard TIS 2134–2022. A key change in this revision is the shift away from relying primarily on the Energy Efficiency Ratio (EER) as the sole performance benchmark. Instead, the updated standard grounds its requirements in both the Cooling Seasonal Performance Factor (CSPF) and EER. The rationale is that CSPF provides a better performance measurement of air conditioners across the range of climatic conditions encountered over a typical cooling season, rather than at a single rating point. By combining the two metrics, the standard aims to provide a more accurate and comprehensive assessment of real-world energy efficiency and to better align regulatory benchmarks with practical operating performance.

148. TIS 2134–2022 defines its criteria according to a unit's cooling capacity and type of electrical supply. It applies to room air conditioners with cooling capacities of up to 18 kW (61,416 BTU/hour). The standard covers units powered by single-phase electricity where the voltage does not exceed 250 volts, while those running on multiple-phase electricity fall within scope, provided the voltage does not exceed 600 volts. Importantly, the standard covers both fixed-speed and variable-speed (inverter) air conditioners, ensuring that the most common technologies in the market are all addressed under a single, consistent regulatory framework.

149. Under TIS 2134–2022, current MEPS for room air conditioners are primarily expressed as a minimum CSPF, set across three cooling-capacity ranges (up to 8,000 W, between 8,000 and 12,000 W, and between 12,000 and 18,000 W) and are differentiated by technology type. For fixed-speed split-type units, the required minimum CSPF ranges from approximately 3.19 W/W for smallest units to 2.68 W/W for the largest ones. Inverter units must meet appreciably higher thresholds, ranging from roughly 3.90 W/W down to 3.46 W/W. In both cases, the required minimum generally decreases as cooling capacity increases, and inverter models are held to stricter performance levels than their fixed-speed counterparts.

¹³ As per the letter of 17 March 2026 from the Department of Industrial Works of the Ministry of Industry of Thailand to the World Bank.

These standards are mandatory rather than advisory: only air conditioners meeting the prescribed minimum energy performance may be placed on the market, and manufacturers must first have their products tested and certified by TISI, before they can be sold.

150. The Electricity Generating Authority of Thailand (EGAT) operates a voluntary energy-efficiency labelling scheme known as “EGAT Label 5”, covering room air conditioners as well as domestic and commercial refrigeration appliances. Its purpose is to steer both manufacturers and consumers toward products with superior energy performance. Although participation is voluntary, the programme is underpinned by rigorous testing procedures: hundreds of air-conditioner and refrigerator models across varied specifications are assessed, and only those meeting the defined performance criteria earn the Label 5 designation.

151. A significant revision took effect on 1 January 2024, when EGAT replaced the previous arrangement — a three-star classification above Label 5 — with a more comprehensive five-star rating system. The change was introduced to better capture the higher efficiency of inverter air conditioners, which outperform conventional models. Under the revised scheme, Label 5 serves as the baseline standard, while appliances exceeding this level are differentiated by a one-to-five-star rating, making the most efficient products easier to identify. Performance is assessed based on seasonal energy efficiency ratios, ensuring evaluation reflects typical usage cycles rather than a single operating point. Appliances qualifying for Label 5 are more efficient than those meeting only the mandatory MEPS set out in TIS 2134–2022, and the top five-star Label 5 units are approximately 20 to 30 percent more efficient than standard Label 5 models.

152. The criteria also distinguish between single-speed and inverter air conditioners, assessing inverters with a metric that better reflects their efficiency. Label 5 inverter units are approximately 30 to 40 per cent more efficient than their single-speed Label 5 counterparts, and at the top of the scale five-star inverter models deliver efficiency gains of 40 to 60 per cent over five-star single-speed units. The 2024 update further extended the programme’s scope to include variable refrigerant flow AC systems for the first time.

Report on HFC consumption

153. An overview of HFC consumption is provided in paragraphs 58 to 61 and in the project evaluation sheet. Table 18 provides a more detailed breakdown of HFC consumption in the AC manufacturing sector.

Table 18. HFC consumption in AC manufacturing sectors in 2020–2024

Sector	Substance	2020	2021	2022	2023	2024
Metric tonnes (mt)						
Light Commercial AC	HFC-32	809	971	1,133	1,295	1,350
	R-407C	5	20	117	124	125
	R-410A	2,495	3,115	3,349	2,183	2,000
Sub-total Light commercial AC		3,309	4,106	4,599	3,602	3,475
Split-type AC	HFC-32	6,852	8,570	8,903	8,903	11,879
	R-410A	2,400	1,600	1,578	1,578	800
Sub-total Split-type AC		9,252	10,170	10,481	10,481	12,679
Total (mt)		12,561	14,276	15,080	14,083	16,154
CO₂-eq tonnes						
Light Commercial AC	HFC-32	546,075	655,425	764,775	874,125	911,250
	R-407C	8,870	35,480	207,558	219,976	221,750
	R-410A	5,209,560	6,504,120	6,992,712	4,558,104	4,176,000
Sub-total Light Commercial AC		5,764,505	7,195,025	7,965,045	5,652,205	5,309,000
Split-type AC	HFC-32	4,625,100	5,784,750	6,009,525	6,009,525	8,018,325
	R-410A	5,011,200	3,340,800	3,294,864	3,294,864	1,670,400
Sub-total Split-type AC		9,636,300	9,125,550	9,304,389	9,304,389	9,688,725
Total (CO₂-eq tonnes)		15,400,805	16,320,575	17,269,434	14,956,594	14,997,725

Project objective

154. The objective of the project is to improve the energy efficiency of six manufacturers of residential and commercial air conditioners. All six enterprises were funded under stage I of the HCFC phase-out management plan (HPMP) for conversion to HFC-32 for small-capacity air conditioners. With the exception of Saijo Denki, all participating enterprises have requested funding to support the conversion of commercial air-conditioner manufacturing from R-410A to HFC-32 in stage I of the KIP. This funding request is presented for consideration at the 98th meeting.

Enterprise background and equipment manufactured

155. The beneficiary enterprises are fully Thai-owned. Table 19 presents a summary of the funding request, as submitted by the enterprises.

Table 19. Summary of information for six AC manufacturers requesting funding

Name	Year of establishment	# of models	Average EE improvement (%)	Capacity (units/year)	Additional capital cost (US \$)	Additional component cost (US \$)	Total (US \$)
Bitwise	1988	45	22.58	27,157	103,376	2,183,693	2,287,069
Eminent	1982	23	14.51	60,131	112,714	2,925,545	3,038,259
PPJ	1993	28	49.83	255,504	250,000	7,417,972	7,667,972
Saijo Denki	1985	26	38.56	47,370	105,755	2,126,853	2,232,608
Supreme	1997	77	67.01	3,475	11,594	153,348	164,942
Unifab	1991	42	55.74	6,177	19,447	345,425	364,872
Total		241	n/a	399,814	602,886	15,152,836	15,755,722

Note: Aggregate values on energy-efficiency improvement are provided as product-wise data is confidential.

156. The estimated energy savings from air conditioners are 427.78 GWh/year following project implementation. Based on carbon emission intensity of electricity generation in Thailand (0.4 kg CO₂/kWh), this corresponds to an estimated carbon emission reduction of 171,113 CO₂-eq tonnes. At an average electricity price of US \$0.11/kWh in Thailand, the project would generate annual savings for air-conditioner consumers of more than US \$47.1 million.

Proposed activities

157. Each participating enterprise commits, upon project completion, to manufacturing equipment that meets at least the target energy-efficiency performance and to making best efforts to further improve their efficiency beyond the project duration. Equipment intended for export will exceed minimum mandatory domestic energy-efficiency standards. The energy efficiency performance of equipment covered under the project will be monitored for two years following project completion by the national ozone unit (NOU) and the World Bank, through appropriate mechanisms. Their efficiency will be verified at project completion, and the quantity of products manufactured over the subsequent year will be used to assess energy-efficiency performance.

Policy-level activities

158. The Government of Thailand commits to upgrading the MEPS regulations and labelling programmes, as well as conducting awareness-raising activities among relevant stakeholders.

159. To ensure successful implementation, technical assistance has been requested for MEPS development through technical and market assessment and monitoring, regional consultations and information exchange on energy-efficiency standards, and random compliance testing. The associated funding request is presented in table 20.

Table 20. Technical assistance and project monitoring and reporting, as submitted

Item	No. of units	Cost/unit (US \$/unit)	Total (US \$)
Market survey and analysis for MEPS and EGAT Label 5 revisions	1	50,000	50,000
Revised MEPS guidelines, testing protocol development	1	50,000	50,000
Regional/ASEAN* MEPS review and collaboration	1	30,000	30,000
Random compliance testing	241	2,250	542,250
Total			672,250

*ASEAN: Association of Southeast Asian Nations

Funding requested as submitted

160. The additional capital and component costs per enterprise were calculated based on tables 1 to 4 of document UNEP/OzL.Pro/ExCom/94/61. A summary of the additional capital and additional component costs is provided in table 21.

Table 21. Summary of the additional capital and additional component costs for the equipment manufacturers and project monitoring and reporting, as submitted (US \$)

Cost item	Additional capital cost	Additional component cost	Total
Residential and commercial air conditioners	602,886	15,152,836	15,755,722
Technical assistance, monitoring and reporting	0	0	672,250
Total			16,427,972

Total cost of the pilot project

161. The total cost of the project to enhance energy efficiency in the manufacture of domestic refrigerators, chest freezers and residential air conditioners amounts to US \$16,427,972, as submitted. The project would be implemented between January 2026 and December 2028.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

162. The project focuses on enterprise-level activities, as well as policy-level activities required for its successful implementation. It is linked to the HFC phase-down investment project presented in the KIP and the EERF project.¹⁴

163. The Secretariat reviewed the project aimed at enhancing energy efficiency in the manufacturing of commercial air conditioners, as well as policy-level activities from both proposed projects based on decision 94/60.

Policy, regulatory and institutional framework

Development and implementation of minimum energy performance standards

164. The World Bank indicated that the Department of Alternative Energy Development and Efficiency (DEDE) and TISI are responsible for developing and enforcing energy-efficiency regulations for refrigeration, AC and heat pump (RACHP) equipment. The current project will support the Government in

¹⁴ UNEP/OzL.Pro/ExCom/98/55

implementing MEPS standards at EGAT Label 5 performance levels. Any further increase beyond these levels will be based on a technical and market assessment planned for 2029.

165. Noting that the project includes some AC models with capacities above 61,416 BTU/hour, the Secretariat sought information on whether MEPS for such units would be established during project implementation to ensure sustained energy-efficiency gains. The World Bank indicated that the Government of Thailand intends to expand the MEPS coverage to equipment with capacities above 61,416 BTU/hour, potentially by December 2029, subject to the outcome of the technical and market assessment scheduled for that year. As mentioned earlier, current MEPS standards already cover units with capacities up to 61,416 BTU/hour.

166. The Secretariat also sought clarification regarding the enterprises' ability to market higher-capacity products, given restrictions on the installation of A2L refrigerant-based equipment in high-rise buildings. The World Bank clarified that the risk assessment included in stage I of the KIP, addressing the use of mildly flammable refrigerants in AC and refrigeration equipment, and expected to be completed by December 2029, is anticipated to have a broader impact on the sales of larger-capacity air conditioners and to facilitate the use of energy-efficient A2L refrigerant-based units in high-rise buildings.

167. In response to questions on whether the proposed MEPS standards exceed the business-as-usual scenario, the World Bank clarified that achieving EGAT Label 5 targets for manufacturing of air conditioners above 61,416 BTU/hour would be feasible only with support for the six participating enterprises. These enterprises are expected to achieve a Label 5, three-star level, which is higher than the current MEPS. Furthermore, products manufactured by other enterprises (representing over 95 per cent of the market) would also meet these targets without financial support. These updated MEPS standards would apply to all products sold domestically and would be followed by manufacturers for products exported.

Enabling conditions for sustainable high energy-efficiency performance

168. The Secretariat also consulted the World Bank on other measures that would be implemented by the Government of Thailand to ensure the sustainable high energy-efficiency performance of air conditioners. Based on the consultations, it was agreed that the NOU and DEDE will:

- (a) In line with paragraph 36 of document UNEP/OzL.Pro/ExCom/94/61, ensure that the project implementation is operationally completed no later than 36 months from the date of approval and return the funding relating to the additional component costs and any other remaining balances that had not already been obligated if the project is not completed by 36 months;
- (b) In line with paragraph 37 of document UNEP/OzL.Pro/ExCom/94/61, ensure that beneficiary enterprises will manufacture equipment with at least the target energy-efficiency performance after project completion, and will continue to make best efforts to continue to improve energy efficiency of the products they manufacture beyond the project duration at their own cost. The performance of equipment manufactured by the enterprises would be monitored for a period of two years from the date of completion of the project by the NOU and the World Bank through appropriate mechanisms;
- (c) In line with paragraph 38 of document UNEP/OzL.Pro/ExCom/94/61, ensure the periodic upgrading of MEPS regulations, labelling programmes and awareness and outreach activities to ensure that the target energy-efficiency levels under the project for the equipment are publicized among different stakeholders; and take steps to implement regulations to ensure that the manufacturing, import and sale of the equipment at least achieve the target energy-efficiency performance levels, at least three years after the date of completion of the project;

- (d) Implement awareness and outreach initiatives, including through ongoing activities under stage III of the HPMP and the KIP, to publicize the activities undertaken under the project, including implementation timelines for MEPS for air conditioners. This will involve coordination with stakeholders and alignment with other national or regional programmes promoting energy-efficient RACHP technologies. The Government will follow its usual interagency consultation and coordination process for implementation of these activities;
- (e) To the extent feasible, introduce and implement other complementary policies and measures that promoted the adoption of energy-efficient equipment in AC applications, ensuring long-term sustainability for project beneficiaries. This will include work with industry associations, energy service company (ESCO) associations, and other stakeholders, to promote the adoption of energy-efficient air conditioners;
- (f) Ensure timely implementation both of the projects in stage I of the KIP and of the proposed energy-efficiency initiatives, in accordance with agreed timelines, policies and regulatory frameworks;
- (g) 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 while implementing the project.

Technical and cost-related issues

Air-conditioner manufacturing

169. The Secretariat assessed the eligible incentives for the AC manufacturing enterprises in line with decision 94/60. In particular, the Secretariat determined the incentives following the methodology outlined in annex II of document UNEP/OzL.Pro/ExCom/94/61 and based on the additional capital costs and additional component costs specified in tables 3 and 4 of that document.

170. After constructive discussions with the World Bank, the key observations and revisions are as follows:

- (a) The Secretariat assessed the eligible incentives for each model based on the methodology set out in document UNEP/OzL.Pro/ExCom/94/61, including table 4 of that document. The resulting costs differed from those proposed by the World Bank, owing to differences in calculations of the costs and the eligible incentive levels across models;
- (b) The Secretariat noted that the baseline energy performance of 54 models (that represent less than 10 per cent of the total number of AC units manufactured by the six enterprises) were below the current MEPS. The additional component costs for these models were adjusted to 50 per cent of the estimated additional component costs;
- (c) The Secretariat discussed the possibility of adopting more ambitious energy-efficiency performance targets, noting that lower targets could pose challenges in enforcing the planned strengthening of MEPS. It suggested that a higher target, such as a target-to-baseline MEPS ratio of 1.45, could be considered, noting that this would affect four enterprises. The World Bank held consultations with the enterprises to explore the possibility of increasing the targets for the models currently below this threshold. However, the enterprises indicated that they were not in a position to achieve such targets, as this would undermine their competitiveness, given customer preferences for lower-cost products and commercial considerations;

- (d) Regarding the enterprises' transition from fixed-speed to variable-speed models, the World Bank explained that there is a local market for fixed-speed models due to their lower cost compared to variable speed models. The enterprises serving the local market would therefore continue to sell fixed-speed models; these models are expected to achieve at least EGAT Label-5 three-star ratings by the end of the project.

171. The agreed additional capital cost and the energy-efficiency performance levels are presented in table 22. The reduction in total agreed funding reflects adjustment to the calculated value of incentive for components, using the methodology described in documents UNEP/OzL.Pro/ExCom/94/61 and Add.1 (i.e., estimating incentive level based on performance improvement and additional component cost divided by three) as approved under decision 94/60.

Table 22. Agreed additional capital and component costs for enterprises manufacturing residential AC equipment (US \$)

As submitted				As agreed			
Additional capital cost	Additional component cost	Total	EE (%)	Additional capital cost	Additional component cost	Total	EE (%)
602,886	15,152,836	15,755,722	38.33	602,886	2,959,709	3,562,595	38.33

172. The World Bank confirmed that all models manufactured by the six enterprises will achieve the specified target performance level, irrespective of whether each of the models qualified for an incentive.

173. Furthermore, the MEPS that the Government has agreed to enforce by the end of the project will be applicable across the entire industry (i.e., domestic manufacturing, imports and exports of domestically manufactured products), thus ensuring the sustainability of the energy-efficiency improvements committed to in the project. The World Bank also confirmed that upon project completion, all enterprises would continue to manufacture and sell products, for both the domestic and export markets, at either the target energy performance level, a higher energy performance level, or specified MEPS levels, whichever resulted in the highest energy performance for the different models.

174. Annex IV provides details on the methods used for calculating incentive levels for manufacturers of air conditioners.

Total energy savings and US \$/kWh/year saved

175. Based on the baseline energy consumption per model, target energy efficiency, and number of units of each model manufactured by the enterprises,¹⁵ the cumulative energy savings are 427.78 million GWh/year. Based on the agreed project costs of US \$3,562,595, this results in a cost-effectiveness of US \$0.0083/kWh/year for this component of the project.

Monitoring and reporting

176. The Secretariat and the World Bank discussed the need for different technical assistance activities and costs associated with monitoring and reporting for the six projects. Following constructive discussions where the efficiencies noted above were taken into account, the costs as presented in table 23 were agreed for monitoring and reporting.

Table 23. Agreed costs for technical assistance, monitoring and reporting (US \$)

Particulars	As agreed
Technical support for market assessment and MEPS revisions	50,000
Revision of MEPS guidelines including for commercial Acs	50,000

¹⁵ Information considered confidential.

Particulars	As agreed
Consultative meetings with ASEAN representatives	15,000
Enterprise level monitoring and technical support	125,000
Support GSB for project monitoring (2 per cent of the project cost)	76,052
Sub-total	316,052

Total project costs

177. The total agreed project costs are provided in table 24.

Table 24. Agreed costs for equipment manufacturing component and project monitoring and reporting (US \$)

Equipment	Additional capital costs	Additional component costs	Total
Air conditioners	602,886	2,959,709	3,562,595
Technical assistance, monitoring and reporting			316,052
Total			3,878,647

Policy-level activities

178. The Secretariat and the World Bank had detailed discussions on the policies and regulations to be implemented by the Government of Thailand to sustain the energy-efficiency gains beyond the completion of the project. While the Government, through EGAT/DEDE, will take measures to strengthen the country's MEPS for air conditioners to EGAT Label 5, three stars or above, it is not in a position to commit to achieving specific MEPS values and timelines, as this requires technical and market assessments, detailed consultations with industry stakeholders and follows an administrative approval process. Accordingly, the following was agreed:

- (a) Consistent with decision 94/60(b)(i), and paragraph 37 of document UNEP/OzL.Pro/ExCom/94/61, the enterprises commit to meeting EGAT Label 5 three-star levels by the completion of the project;
- (b) EGAT, in coordination with DEDE, would continue to revise the country's MEPS following its national process, including market assessment and make best efforts to increase the MEPS in a sustained manner; and
- (c) The World Bank and the Government of Thailand will provide to the first meeting of every year starting in 2028, an annual update on the outcome of the process of revising the country's MEPS.

179. The Secretariat considers that the aforementioned conditions will promote the sustainability of the project and support the advancement of higher energy-efficiency standards across the country. The standards developed under MEPS and other measures would apply to other enterprises who manufacture air conditioners. Furthermore, given that Thailand is also a leading exporter of air conditioners, there is an expected strong momentum in achieving higher energy-efficiency performance levels to cater to different markets. The Secretariat notes with appreciation the enterprises' commitment to improving the energy efficiency of equipment they manufacture, and to continuing to do so after the completion of the project, which is expected to facilitate the MEPS review process.

180. As described in table 11, five of the six of the beneficiary enterprises are participating in stage I of the KIP to convert their AC manufacturing from R-410A to HFC-32. However, these conversions concern larger AC units rather than the small-capacity units whose energy efficiency is to be improved under the present project. The beneficiary enterprises under the present project had already converted their manufacturing of relevant AC units from HCFC-22 to HFC-32 under stage I of the HPMP, approved at the

68th meeting prior to the adoption of the Kigali Amendment. While the initial choice of the enterprises was to convert to R-410A, a high-GWP HFC blend, they had agreed to adopt HFC-32 following extensive consultations with the NOU.¹⁶ This proactive approach adopted by the enterprises during HPMP implementation avoided a transition to high-GWP refrigerant-based air conditioners. The Secretariat acknowledges the proactive role played by these enterprises in embracing more environmentally sound technologies ahead of the broader regulatory framework and affirms that such early and cooperative action should not operate to their disadvantage in accessing support under the present project submitted pursuant to decision 94/60.

181. In light of this, the Secretariat recommends, on an exceptional basis, that the enterprises be considered for funding under decision 94/60, given that the Government had originally proposed to convert the manufacturing sector to R-410A.

182. This issue has been included in the Overview of issues identified during project review.¹⁷

Sustainability of the pilot project and assessment of risks

183. The project is designed to sustain high energy-efficiency performance both within the six participating enterprises and across the wider Thai market. At the enterprise level, the funding upgrades design, tooling and testing capability so that manufacturers can produce higher-efficiency air conditioners on a continuing basis, and the enterprises have committed to keep improving their products' efficiency beyond the project's duration. To embed these gains market-wide, the Government of Thailand would periodically upgrade the mandatory MEPS (TIS 2134-2022) and the EGAT Label 5 programme to achieve higher energy performance. Furthermore, given the exposure of Thailand's industry to the global market and the fact that Thailand is an important exporter of AC equipment, achieving target energy-efficiency levels within three years and sustaining energy-efficiency improvement is highly feasible. This regulatory backstop would result in the entire market i.e., the six participating enterprises and other manufacturers, to sustainably improve energy performance of equipment. Sustainability is reinforced further by two years of post-completion performance monitoring with World Bank support, detailed implementation reporting, awareness-raising and outreach delivered through stage III of the HPMP and the KIP, and complementary policies pursued with industry and ESCO associations—together aligning enterprise capability with market regulation and consumer demand.

184. The Secretariat notes that a substantial proportion of the agreed funding (US \$2,959,709) is associated with additional component costs, half of which would be disbursed in three years, and the other half in four years, upon confirmation of total quantities manufactured at the target energy-efficiency performance levels, in line with decision 94/50(e). The World Bank confirmed it would abide by decision 94/50(e); that the funding associated with the additional component costs would not be used for any other purpose; and that the World Bank would include those balances and the interest gained from those balances as part of its regular annual financial reporting to the Executive Committee. In light of the above, the Secretariat therefore considers the risks associated with transferring the funding to the World Bank at the present meeting to be low.

¹⁶ The project proposal was considered at the 66th, 67th and 68th meetings: paragraphs 160-161 of document UNEP/OzL.Pro/ExCom/66/54 and decision 66/49; paragraphs 104-107 of document UNEP/OzL.Pro/ExCom/67/39 and decision 67/3; and paragraphs 161-63 of document UNEP/OzL.Pro/ExCom/68/53 and decision 68/39.

¹⁷ Document UNEP/OzL.Pro/ExCom/98/10

RECOMMENDATION

185. The Executive Committee may wish to consider approving, on an exceptional basis, the project to enhance the energy efficiency in the manufacturing of air conditioners in Thailand, in the amount of US \$3,878,647, plus agency support costs of US \$271,505, for the World Bank, noting:

- (a) That the Government of Thailand would revise the minimum energy performance standards (MEPS) by 1 January 2030, based on the market survey and agreement with the relevant national stakeholders;
- (b) That the Government of Thailand had committed to undertake the activities referred to in subparagraphs (i) to (vii) below:
 - (i) In line with paragraph 36 of document UNEP/OzL.Pro/ExCom/94/61, ensure that project implementation was operationally completed no later than 36 months from the date of approval and return the funding relating to the additional component costs and any other remaining balances that had not already been obligated if the project was not completed within 36 months;
 - (ii) In line with paragraph 37 of document UNEP/OzL.Pro/ExCom/94/61, ensure that the beneficiary enterprises will manufacture equipment with at least the target energy-efficiency performance after project completion, and to continue to make their best efforts to continue to improve energy efficiency of the products beyond the project implementation duration at their own cost; the performance of equipment manufactured by the enterprises would be monitored for a period of two years from the date of completion of the project by the national ozone unit and the World Bank through appropriate mechanisms;
 - (iii) In line with paragraph 38 of document UNEP/OzL.Pro/ExCom/94/61, ensure the periodic upgrading of MEPS regulations, labelling programmes and awareness and outreach activities to ensure that the target energy-efficiency levels under the project for the equipment are publicized among different stakeholders; and take steps to implement regulations to ensure that the manufacturing, import and sale of the equipment at least achieved the target energy-efficiency performance levels, at least three years after the date of completion of the project;
 - (iv) Implement awareness and outreach initiatives, including through ongoing activities under stage III of the HCFC phase-out management plan and stage I of the Kigali HFC implementation plan (KIP), to publicize the activities undertaken under the project including implementation timelines for MEPS for air conditioners, including coordination with stakeholders and alignment with other national or regional programmes promoting energy-efficient refrigeration, air-conditioning and heat-pump technologies;
 - (v) To the extent feasible, introduce and implement other complementary policies and measures that promoted the adoption of energy-efficient equipment in air-conditioning applications, ensuring long-term sustainability for project beneficiaries. This will include work with industry associations, ESCO associations, and other stakeholders, to promote the adoption of energy-efficient air-conditioning equipment;
 - (vi) Ensure timely implementation both of the projects in stage I of the KIP and of the proposed energy-efficiency initiatives, in accordance with agreed timelines,

policies and regulatory frameworks; and

- (vii) 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 while implementing the project;
- (c) That the project would be operationally completed no later than 30 June 2029, and that a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project;
- (d) That the Government of Thailand, through the World Bank, would submit to the first meeting of the year starting in 2028, an annual update on the status of its revision of the MEPS for air conditioners until the Electricity Generating Authority of Thailand Label 5, three stars or above levels are met; and
- (e) That, if the Government did not comply with the conditions specified in subparagraphs (b)(i) to (vii) above, the Executive Committee would take that into account when considering future projects submitted by Thailand not related to compliance.

Annex I

DRAFT AGREEMENT BETWEEN THE GOVERNMENT OF THAILAND AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS IN ACCORDANCE WITH STAGE III OF THE HCFC PHASE-OUT MANAGEMENT PLAN

Purpose

1. This Agreement represents the understanding of the Government of Thailand (the “Country”) and the Executive Committee with respect to the reduction of controlled use of the ozone-depleting substances (ODS) set out in Appendix 1-A (“The Substances”) to a sustained level of 0 ODP tonnes by 1 January 2030 in compliance with Montreal Protocol schedule.
2. The Country agrees to meet the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A (“The Targets, and Funding”) in this Agreement as well as in the Montreal Protocol reduction schedule for all Substances mentioned in Appendix 1-A. The Country accepts that, by its acceptance of this Agreement and performance by the Executive Committee of its funding obligations described in paragraph 3, it is precluded from applying for or receiving further funding from the Multilateral Fund in respect to any consumption of the Substances that exceeds the level defined in row 1.2 of Appendix 2-A as the final reduction step under this Agreement for all of the Substances specified in Appendix 1-A, and in respect to any consumption of each of the Substances that exceeds the level defined in rows 4.1.3, 4.2.3, 4.3.3, 4.4.3, 4.5.3, 4.6.3, and 4.7.3 (remaining consumption eligible for funding).
3. Subject to compliance by the Country with its obligations set out in this Agreement, the Executive Committee agrees, in principle, to provide the funding set out in row 3.1 of Appendix 2-A to the Country. The Executive Committee will, in principle, provide this funding at the Executive Committee meetings specified in Appendix 3-A (“Funding Approval Schedule”).
4. The Country agrees to implement this Agreement in accordance with stage III of the HCFC phase-out management plan approved (“the Plan”). In accordance with subparagraph 5(b) of this Agreement, the Country will accept independent verification of the achievement of the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A of this Agreement. The aforementioned verification will be commissioned by the relevant bilateral or implementing agency.

Conditions for funding release

5. The Executive Committee will only provide the Funding in accordance with the Funding Approval Schedule when the Country satisfies the following conditions at least 10/12 weeks in advance of the applicable Executive Committee meeting set out in the Funding Approval Schedule:
 - (a) That the Country has met the Targets set out in row 1.2 of Appendix 2-A for all relevant years. Relevant years are all years since the year in which this Agreement was approved. Years for which there are no due country programme implementation reports at the date of the Executive Committee meeting at which the funding request is being presented are exempted;
 - (b) That the meeting of these Targets has been independently verified for all relevant years, unless the Executive Committee decided that such verification would not be required;
 - (c) That the Country had submitted a Tranche Implementation Report in the form of Appendix 4-A (“Format of Tranche Implementation Reports and Plans”) covering each previous calendar year; that it had achieved a significant level of implementation of

activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent; and

- (d) That the Country has submitted a Tranche Implementation Plan in the form of Appendix 4-A covering each calendar year until and including the year for which the funding schedule foresees the submission of the next tranche or, in case of the final tranche, until completion of all activities foreseen.

Monitoring

6. The Country will ensure that it conducts accurate monitoring of its activities under this Agreement. The institutions set out in Appendix 5-A (“Monitoring Institutions and Roles”) will monitor and report on implementation of the activities in the previous Tranche Implementation Plans in accordance with their roles and responsibilities set out in the same Appendix.

Flexibility in the reallocation of funds

7. The Executive Committee agrees that the Country may have the flexibility to reallocate part or all of the approved funds, according to the evolving circumstances to achieve the smoothest reduction of consumption and phase-out of the Substances specified in Appendix 1-A:

- (a) Reallocations categorized as major changes must be documented in advance either in a Tranche Implementation Plan as foreseen in subparagraph 5(d) above, or as a revision to an existing Tranche Implementation Plan to be submitted eight weeks prior to any meeting of the Executive Committee, for its approval. Major changes would relate to:
 - (i) Issues potentially concerning the rules and policies of the Multilateral Fund;
 - (ii) Changes which would modify any clause of this Agreement;
 - (iii) Changes in the annual levels of funding allocated to individual bilateral or implementing agencies for the different tranches;
 - (iv) Provision of funding for activities not included in the current endorsed Tranche Implementation Plan, or removal of an activity in the Tranche Implementation Plan, with a cost greater than 30 per cent of the total cost of the last approved tranche;
 - (v) Changes in alternative technologies, on the understanding that any submission for such a request would identify the associated incremental costs, the potential impact to the climate, and any differences in ODP tonnes to be phased out if applicable, as well as confirm that the Country agrees that potential savings related to the change of technology would decrease the overall funding level under this Agreement accordingly;
- (b) Reallocations not categorized as major changes may be incorporated in the approved Tranche Implementation Plan, under implementation at the time, and reported to the Executive Committee in the subsequent Tranche Implementation Report; and
- (c) Any remaining funds held by the bilateral or implementing agencies or the Country under the Plan will be returned to the Multilateral Fund upon completion of the last tranche foreseen under this Agreement.

Considerations for the refrigeration servicing sector

8. Specific attention will be paid to the execution of the activities in the refrigeration servicing sector included in the Plan, in particular:

- (a) The Country would use the flexibility available under this Agreement to address specific needs that might arise during project implementation; and
- (b) The Country and relevant bilateral and/or implementing agencies would take into consideration relevant decisions on the refrigeration servicing sector during the implementation of the Plan.

Bilateral and implementing agencies

9. The Country agrees to assume overall responsibility for the management and implementation of this Agreement and of all activities undertaken by it or on its behalf to fulfil the obligations under this Agreement. The World Bank has agreed to be the lead implementing agency (the “Lead IA”) in respect of the Country’s activities under this Agreement. The Country agrees to evaluations, which might be carried out under the monitoring and evaluation work programmes of the Multilateral Fund or under the evaluation programme of the Lead IA taking part in this Agreement.

10. The Lead IA will be responsible for ensuring coordinated planning, implementation and reporting of all activities under this Agreement, including but not limited to independent verification as per subparagraph 5(b). The role of the Lead IA is contained in Appendix 6-A. The Executive Committee agrees, in principle, to provide the Lead IA with the fees set out in row 2.2 of Appendix 2-A.

Non-compliance with the Agreement

11. Should the Country, for any reason, not meet the Targets for the elimination of the Substances set out in row 1.2 of Appendix 2-A or otherwise does not comply with this Agreement, then the Country agrees that it will not be entitled to the Funding in accordance with the Funding Approval Schedule. At the discretion of the Executive Committee, funding will be reinstated according to a revised Funding Approval Schedule determined by the Executive Committee after the Country has demonstrated that it has satisfied all of its obligations that were due to be met prior to receipt of the next tranche of funding under the Funding Approval Schedule. The Country acknowledges that the Executive Committee may reduce the amount of the Funding by the amount set out in Appendix 7-A (“Reductions in Funding for Failure to Comply”) in respect of each ODP kg of reductions in consumption not achieved in any one year. The Executive Committee will discuss each specific case in which the Country did not comply with this Agreement, and take related decisions. Once decisions are taken, the specific case of non-compliance with this Agreement will not be an impediment for the provision of funding for future tranches as per paragraph 5 above.

12. The Funding of this Agreement will not be modified on the basis of any future Executive Committee decisions that may affect the funding of any other consumption sector projects or any other related activities in the Country.

13. The Country will comply with any reasonable request of the Executive Committee and the Lead IA to facilitate implementation of this Agreement. In particular, it will provide the Lead IA with access to the information necessary to verify compliance with this Agreement.

Date of completion

14. The completion of the Plan and the associated Agreement will take place at the end of the year following the last year for which a maximum allowable total consumption level has been specified in

Appendix 2-A. Should at that time there still be activities that are outstanding, and which were foreseen in the last Tranche Implementation Plan and its subsequent revisions as per subparagraph 5(d) and paragraph 7, the completion of the Plan will be delayed until the end of the year following the implementation of the remaining activities. The reporting requirements as per subparagraphs 1(a), 1(b), 1(d), and 1(e) of Appendix 4-A will continue until the time of the completion of the Plan unless otherwise specified by the Executive Committee.

Validity

15. All of the conditions set out in this Agreement are undertaken solely within the context of the Montreal Protocol and as specified in this Agreement. All terms used in this Agreement have the meaning ascribed to them in the Montreal Protocol unless otherwise defined herein.

16. This Agreement may be modified or terminated only by mutual written agreement between the Government of the Country and the Executive Committee of the Multilateral Fund.

APPENDICES

APPENDIX 1-A: THE SUBSTANCES

Substance	Annex	Group	Starting point for aggregate reductions in consumption (ODP tonnes)
HCFC-22	C	I	716.57
HCFC-123	C	I	3.20
HCFC-124	C	I	0.08
HCFC-141b	C	I	205.25
HCFC-142b	C	I	0.12
HCFC-225 ca/cb	C	I	2.30
Subtotal			927.52
HCFC-141b contained in imported pre-blended polyols			15.68
Total			943.20

APPENDIX 2-A: THE TARGETS, AND FUNDING

Row	Particulars	2026	2027	2028	2029	2030	2031-2032	2033	2034	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	301.47	301.47	301.47	301.47	0.00	0.00	0.00	0.00	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	301.47	301.47	301.47	301.47	0.00	0.00	0.00	0.00	n/a
2.1	Lead IA (World Bank) agreed funding (US \$)	5,574,980	0	6,183,876	0	4,829,180	0	1,832,004	0	18,420,040
2.2	Support costs for Lead IA (US \$)	390,249	0	432,871	0	338,043	0	128,240	0	1,289,403
3.1	Total agreed funding (US \$)	5,574,980	0	6,183,876	0	4,829,180	0	1,832,004	0	18,420,040
3.2	Total support costs (US \$)	390,249	0	432,871	0	338,043	0	128,240	0	1,289,403
3.3	Total agreed costs (US \$)	5,965,229	0	6,616,747	0	5,167,223	0	1,960,244	0	19,709,443

4.1.1	Total phase-out of HCFC-22 agreed to be achieved under this Agreement (ODP tonnes)	382.46
4.1.2	Phase-out of HCFC-22 to be achieved in the previous stage (ODP tonnes)	334.11
4.1.3	Remaining eligible consumption for HCFC-22 (ODP tonnes)	0.00
4.2.1	Total phase-out of HCFC-123 agreed to be achieved under this Agreement (ODP tonnes)	3.20
4.2.2	Phase-out of HCFC-123 to be achieved in the previous stage (ODP tonnes)	0.00
4.2.3	Remaining eligible consumption for HCFC-123 (ODP tonnes)	0.00
4.3.1	Total phase-out of HCFC-124 agreed to be achieved under this Agreement (ODP tonnes)	0.00
4.3.2	Phase-out of HCFC-124 to be achieved in the previous stage (ODP tonnes)	0.08
4.3.3	Remaining eligible consumption for HCFC-124 (ODP tonnes)	0.00
4.4.1	Total phase-out of HCFC-141b agreed to be achieved under this Agreement (ODP tonnes)	22.04
4.4.2	Phase-out of HCFC-141b to be achieved in the previous stage (ODP tonnes)	183.21
4.4.3	Remaining eligible consumption for HCFC-141b (ODP tonnes)	0.00
4.5.1	Total phase-out of HCFC-142b agreed to be achieved under this Agreement (ODP tonnes)	0.00
4.5.2	Phase-out of HCFC-142b to be achieved in the previous stage (ODP tonnes)	0.12
4.5.3	Remaining eligible consumption for HCFC-142b (ODP tonnes)	0.00
4.6.1	Total phase-out of HCFC-225 ca/cb agreed to be achieved under this Agreement (ODP tonnes)	2.30
4.6.2	Phase-out of HCFC-225 ca/cb to be achieved in the previous stage (ODP tonnes)	0.00
4.6.3	Remaining eligible consumption for HCFC-225 ca/cb (ODP tonnes)	0.00
4.7.1	Total phase-out of HCFC-141b contained in imported pre-blended polyols agreed to be achieved under this Agreement (ODP tonnes)	0.00
4.7.2	Phase-out of HCFC-141b contained in imported pre-blended polyols to be achieved in the previous stage (ODP tonnes)	15.68
4.7.3	Remaining eligible consumption for HCFC-141b contained in imported pre-blended polyols (ODP tonnes)	0.00

* Date of completion of stage II as per stage II Agreement: 30 June 2025

APPENDIX 3-A: FUNDING APPROVAL SCHEDULE

1. Funding for the future tranches will be considered for approval at the second meeting of the year specified in Appendix 2-A.

APPENDIX 4-A: FORMAT OF TRANCHE IMPLEMENTATION REPORTS AND PLANS

1. The submission of the Tranche Implementation Report and Plans for each tranche request will consist of five parts:

- (a) A narrative report, with data provided by tranche, describing the progress achieved since the previous report, reflecting the situation of the Country in regard to phase out of the Substances, how the different activities contribute to it, and how they relate to each other. The report should include the amount of ODS phased out as a direct result from the implementation of activities, by substance, and the alternative technology used and the related phase-in of alternatives, to allow the Secretariat to provide to the Executive Committee information about the resulting change in climate relevant emissions. The report should further highlight successes, experiences, and challenges related to the different activities included in the Plan, reflecting any changes in the circumstances in the Country, and providing other relevant information. The report should also include information on and justification for any changes vis-à-vis the previously submitted Tranche Implementation Plan(s), such as delays, uses of the flexibility for reallocation of funds during implementation of a tranche, as provided for in paragraph 7 of this Agreement, or other changes;
- (b) An independent verification report of the Plan results and the consumption of the Substances, as per subparagraph 5(b) of the Agreement. If not decided otherwise by the Executive Committee, such a verification has to be provided together with each tranche request and will have to provide verification of the consumption for all relevant years as

specified in subparagraph 5(a) of the Agreement for which a verification report has not yet been acknowledged by the Committee;

- (c) A written description of the activities to be undertaken during the period covered by the requested tranche, highlighting implementation milestones, the time of completion and the interdependence of the activities, and taking into account experiences made and progress achieved in the implementation of earlier tranches; the data in the plan will be provided by calendar year. The description should also include a reference to the overall Plan and progress achieved, as well as any possible changes to the overall Plan that are foreseen. The description should also specify and explain in detail such changes to the overall plan. This description of future activities can be submitted as a part of the same document as the narrative report under subparagraph (a) above;
- (d) A set of quantitative information for all Tranche Implementation Reports and Plans, submitted through an online database; and
- (e) An Executive Summary of about five paragraphs, summarizing the information of the above subparagraphs 1(a) to 1(d).

2. In the event that in a particular year two stages of the Plan are being implemented in parallel, the following considerations should be taken in preparing the Tranche Implementation Reports and Plans:

- (a) The Tranche Implementation Reports and Plans referred to as part of this Agreement, will exclusively refer to activities and funds covered by this Agreement; and
- (b) If the stages under implementation have different HCFC consumption targets under Appendix 2-A of each Agreement in a particular year, the lower HCFC consumption target will be used as reference for compliance with these Agreements and will be the basis for the independent verification.

APPENDIX 5-A: MONITORING INSTITUTIONS AND ROLES

1. The Thailand National Focal Point for the Implementation of the Montreal Protocol (the national ozone unit (NOU)) of the Department of Industrial Works (DIW) within the Ministry of Industry, is responsible for managing and coordinating Thailand's Plan, including all phase-out activities and measures controlling HCFCs. The management and implementation of this Agreement will be undertaken by the project management unit (PMU), which falls under the direct authority of the NOU.

2. DIW, through its PMU and the NOU, will collaborate and coordinate with the Ministry of Finance (MOF) and the Customs Department to implement the import/control system for HCFCs; review annual HCFC import/export license applications; and establish and publish the annual import quotas for HCFCs for the period 2026–2034.

3. In order to assist DIW in monitoring and evaluating the progress of the Agreement implementation, the PMU and the NOU will:

- (a) Update the HCFC management information system (MIS) that captures and tracks all relevant and required data on the importation of HCFCs on an annual basis;
- (b) Update the data on the actual amount of imported HCFCs;
- (c) Monitor and report, in cooperation with the Customs Department, any incidents of illegal import of HCFCs;

- (d) Monitor progress of HCFC phase-out on the demand side;
- (e) Maintain the Plan's MIS on HCFC-consuming enterprises;
- (f) Compile periodic progress reports of the Plan's implementation and HCFC phase-out achievements for sharing with DIW, the MOF, the Customs Department, and the Ministry of Planning and Investment;
- (g) Prepare Tranche Implementation Reports and Plans according to the schedule set forth in Appendix 2-A;
- (h) Prepare other monitoring reports as required by DIW or other Government authorities and by Executive Committee decision, in coordination with the Lead IA; and
- (i) Carry out safety and technical review of all relevant activities undertaken under this Plan.

4. DIW along with its government partner agencies (MOF, the Customs Department and the Ministry of Planning and Investment) will be responsible for reviewing PMU reports and data and instituting control and policy measures which facilitate HCFC control and reductions according to the Agreement.

APPENDIX 6-A: ROLE OF THE LEAD IMPLEMENTING AGENCY

1. The Lead IA will be responsible for a range of activities, including at least the following:
 - (a) Ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country's Plan;
 - (b) Assisting the Country in preparation of the Tranche Implementation Reports and Plans as per Appendix 4-A;
 - (c) Providing independent verification to the Executive Committee that the Targets have been met and associated tranche activities have been completed as indicated in the Tranche Implementation Plan consistent with Appendix 4-A;
 - (d) Ensuring that the experiences and progress is reflected in updates of the overall plan and in future Tranche Implementation Plans consistent with subparagraphs 1(c) and 1(d) of Appendix 4-A;
 - (e) Fulfilling the reporting requirements for the Tranche Implementation Reports and Plans and the overall plan as specified in Appendix 4-A for submission to the Executive Committee;
 - (f) In the event that the last funding tranche is requested one or more years prior to the last year for which a consumption target had been established, annual tranche implementation reports and, where applicable, verification reports on the current stage of the Plan should be submitted until all activities foreseen had been completed and HCFC consumption targets had been met;
 - (g) Ensuring that appropriate independent technical experts carry out the technical reviews;
 - (h) Carrying out required supervision missions;

- (i) Ensuring the presence of an operating mechanism to allow effective, transparent implementation of the Tranche Implementation Plan and accurate data reporting;
- (j) In case of reductions in funding for failure to comply in accordance with paragraph 11 of the Agreement, to determine, in consultation with the Country, the allocation of the reductions to the different budget items and to the funding of the Lead IA;
- (k) Ensuring that disbursements made to the Country are based on the use of the indicators;
- (l) Providing assistance with policy, management and technical support when required; and
- (m) Timely releasing funds to the Country/participating enterprises for completing the activities related to the project.

2. After consultation with the Country and taking into account any views expressed, the Lead IA will select and mandate an independent entity to carry out the verification of the Plan's results and the consumption of the Substances mentioned in Appendix 1-A, as per subparagraph 5(b) of the Agreement and subparagraph 1(b) of Appendix 4-A.

APPENDIX 7-A: REDUCTIONS IN FUNDING FOR FAILURE TO COMPLY

1. In accordance with paragraph 11 of the Agreement, the amount of funding provided may be reduced by US \$89.85 per ODP kg of consumption beyond the level defined in row 1.2 of Appendix 2-A for each year in which the target specified in row 1.2 of Appendix 2-A has not been met, on the understanding that the maximum funding reduction would not exceed the funding level of the tranche being requested. Additional measures might be considered in cases where non-compliance extends for two consecutive years.

2. In the event that the penalty needs to be applied for a year in which there are two Agreements in force (two stages of the Plan being implemented in parallel) with different penalty levels, the application of the penalty will be determined on a case-by-case basis taking into consideration the specific sectors that lead to the non-compliance. If it is not possible to determine a sector, or both stages are addressing the same sector, the penalty level to be applied would be the largest.

Annex II

DRAFT AGREEMENT BETWEEN THE GOVERNMENT OF THAILAND AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROFLUOROCARBONS IN ACCORDANCE WITH STAGE I OF THE KIGALI HFC IMPLEMENTATION PLAN (Period: 2026–2034)

Purpose

1. This Agreement represents the understanding of the Government of Thailand (“the Country”) and the Executive Committee with respect to the reduction of controlled use of Annex F substances set out in Appendix 1-A (“The Substances”) to a sustained level of 47,416,761 CO₂-equivalent (CO₂-eq) tonnes by 1 January 2029 in compliance with the Montreal Protocol schedule and the terms of this Agreement.
2. The Country agrees to meet the annual consumption limits of Annex F substances as set out in row 1.2 of Appendix 2-A (“The Targets, and Funding”) in this Agreement as well as in the Montreal Protocol reduction schedule for Annex F substances mentioned in Appendix 1-A. The Country accepts that, by its acceptance of this Agreement and performance by the Executive Committee of its funding obligations described in paragraph 3, it is precluded from applying for or receiving further funding from the Multilateral Fund in respect to any consumption of Annex F substances that exceeds the level defined in row 1.2 of Appendix 2-A as the final reduction step under this Agreement for Annex F substances specified in Appendix 1-A, and in respect to any consumption of Annex F substances that exceeds the levels defined in rows 4.1.3 and 4.2.3 (remaining consumption eligible for funding).
3. Subject to compliance by the Country with its obligations set out in this Agreement, the Executive Committee agrees, in principle, to provide the funding set out in row 3.1 of Appendix 2-A to the Country. The Executive Committee will, in principle, provide this funding at the Executive Committee meetings specified in Appendix 3-A (“Funding Approval Schedule”).
4. The Country agrees to implement this Agreement in accordance with stage I of the Kigali HFC implementation plan (“the Plan”) as approved. In accordance with subparagraph 5(b) of this Agreement, the Country will accept independent verification of the achievement of the annual consumption limits of Annex F substances set out in row 1.2 of Appendix 2-A of this Agreement. The aforementioned verification will be commissioned by the relevant bilateral or implementing agency.

Conditions for funding release

5. The Executive Committee will only provide the Funding, in accordance with the Funding Approval Schedule, when the Country satisfies the following conditions at least 10 weeks in advance of the applicable Executive Committee meeting set out in the Funding Approval Schedule:
 - (a) That the Country has met the Targets set out in row 1.2 of Appendix 2-A for all relevant years. Relevant years are all years since the year in which this Agreement was approved. Years for which there are no due country programme implementation reports at the date of the Executive Committee meeting at which the funding request is being presented are exempted;
 - (b) That the meeting of these Targets has been independently verified for all relevant years, unless the Executive Committee decided that such verification would not be required;
 - (c) That the Country had submitted a Tranche Implementation Report in accordance with

Appendix 4-A (“Format of Tranche Implementation Reports and Plans”) covering each previous calendar year; that it had achieved a significant level of implementation of activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent; and

- (d) That the Country has submitted a Tranche Implementation Plan in accordance with Appendix 4-A covering each calendar year until and including the year for which the Funding Approval Schedule foresees the submission of the next tranche or, in case of the final tranche, until completion of all activities foreseen.

Monitoring

6. The Country will ensure that it conducts accurate monitoring of its activities under this Agreement. The institutions set out in Appendix 5-A (“Monitoring Institutions and Roles”) will monitor and report on implementation of the activities in the previous Tranche Implementation Plans in accordance with their roles and responsibilities set out in the same appendix.

Flexibility in the reallocation of funds

7. The Executive Committee agrees that the Country may have the flexibility to reallocate part or all approved funds, according to the evolving circumstances, to achieve the smoothest reduction of consumption and phase-down of Annex F substances specified in Appendix 1-A, in accordance with the following considerations:

- (a) Reallocations categorized as major changes must be documented in advance, either in a Tranche Implementation Plan as foreseen in subparagraph 5(d) above, or as a revision to an existing Tranche Implementation Plan to be submitted 10 weeks prior to any meeting of the Executive Committee, for its approval. Major changes would relate to:
 - (i) Issues potentially concerning the rules and policies of the Multilateral Fund;
 - (ii) Changes that would modify any clause of this Agreement;
 - (iii) Changes in the annual levels of funding allocated to the individual bilateral or implementing agencies for the different tranches;
 - (iv) Provision of funding for activities not included in the current endorsed Tranche Implementation Plan, or removal of an activity in the Tranche Implementation Plan, with a cost greater than 30 per cent of the total cost of the last approved tranche;
 - (v) Changes in alternative technologies, on the understanding that any submission for such a request would identify the associated incremental costs, the potential impact on the climate, and any differences in CO₂-eq tonnes to be phased down if applicable, as well as confirm that the Country agrees that potential savings related to the change of technology would accordingly decrease the overall funding level under this Agreement;
- (b) Reallocations not categorized as major changes may be incorporated into the approved Tranche Implementation Plan, under implementation at the time, and reported to the Executive Committee in the subsequent Tranche Implementation Report;
- (c) Any enterprise included in the Plan that would be found to be ineligible under the policies of the Multilateral Fund (i.e., due to foreign ownership or establishment after the applicable

cut off date) would not receive financial assistance. This information would be reported as part of the Tranche Implementation Plan; and

- (d) Any remaining funds held by the bilateral or implementing agencies or the Country under the Plan will be returned to the Multilateral Fund upon completion of the last tranche foreseen under this Agreement.

8. Specific attention will be paid to the execution of activities in the refrigeration servicing sector included in the Plan, in particular that the Country may use the flexibility available under this Agreement to address specific needs that might arise during project implementation.

Bilateral and implementing agencies

9. The Country agrees to assume overall responsibility for the management and implementation of this Agreement and of all activities undertaken by it or on its behalf to fulfil the obligations under this Agreement. The World Bank has agreed to be the lead implementing agency (the “Lead IA”) in respect of the Country’s activities under this Agreement. The Country agrees to evaluations, which might be carried out under the monitoring and evaluation work programmes of the Multilateral Fund or under the evaluation programme of the Lead IA taking part in this Agreement.

10. The Lead IA will be responsible for ensuring coordinated planning, implementation and reporting of all activities under this Agreement, including but not limited to the independent verification as per subparagraph 5(b). The role of the Lead IA is contained in Appendix 6-A. The Executive Committee agrees, in principle, to provide the Lead IA with the fees set out in row 2.2 of Appendix 2-A.

Non-compliance with the Targets in the Agreement

11. Should the Country, for any reason, not meet the Targets for the elimination of Annex F substances set out in row 1.2 of Appendix 2-A or otherwise does not comply with this Agreement, then the Country agrees that it will not be entitled to the Funding in accordance with the Funding Approval Schedule. At the discretion of the Executive Committee, funding will be reinstated according to a revised Funding Approval Schedule determined by the Executive Committee after the Country has demonstrated that it has satisfied all its obligations that were due to be met prior to receipt of the next tranche of funding under the Funding Approval Schedule. The Country acknowledges that the Executive Committee may reduce the amount of the Funding by the amount set out in Appendix 7-A (“Reductions in Funding for Failure to Comply”) in respect of each CO₂-eq kg of reductions in consumption not achieved in any one year. The Executive Committee will discuss each specific case in which the Country did not comply with this Agreement and take related decisions. Once decisions are taken, the specific case of non-compliance with this Agreement will not be an impediment for the provision of funding for future tranches as per paragraph 5 above.

12. The Funding of this Agreement will not be modified on the basis of any future Executive Committee decisions that may affect the funding of any other consumption sector projects or any other related activities in the Country.

13. The Country will comply with any reasonable request of the Executive Committee and the Lead IA to facilitate implementation of this Agreement. In particular, it will provide the Lead IA with access to the information necessary to verify compliance with this Agreement.

Date of completion

14. The completion of the Plan and the associated Agreement will take place at the end of the year following the last year for which a maximum allowable total consumption level has been specified in Appendix 2-A. Should at that time there still be activities that are outstanding, and which were foreseen in the last Tranche Implementation Plan and its subsequent revisions as per subparagraph 5(d) and

paragraph 7, the completion of the Plan will be delayed until the end of the year following the implementation of the remaining activities. The reporting requirements as per subparagraphs 1(a), 1(b), and 1(d) of Appendix 4-A will continue until the time of the completion of the Plan unless otherwise specified by the Executive Committee.

Validity

15. All conditions set out in this Agreement are undertaken solely within the context of the Montreal Protocol and as specified in this Agreement. All terms used in this Agreement have the meaning ascribed to them in the Montreal Protocol unless otherwise defined herein.

16. This Agreement may be modified or terminated only by mutual written agreement of the Country and the Executive Committee of the Multilateral Fund.

APPENDICES

APPENDIX 1-A: THE SUBSTANCES

Substances	Starting point for aggregate reductions in consumption (CO₂-eq tonnes)
HFCs	To be determined (TBD)
HFCs contained in imported pre-blended polyols	TBD

APPENDIX 2-A: THE TARGETS, AND FUNDING

Row	Particulars		2018*	2026	2027	2028	2029	2030	2031-2032	2033	2034	Total
1.1	Montreal Protocol reduction schedule of Annex F substances	%	n/a	freeze	freeze	freeze	10	10	10	10	10	n/a
		CO ₂ -eq tonnes	n/a	59,270,951	59,270,951	59,270,951	53,343,856	53,343,856	53,343,856	53,343,856	53,343,856	n/a
1.2	Maximum allowable total consumption of Annex F substances	Reduction in %	n/a	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	n/a
		CO ₂ -eq tonnes	n/a	59,270,951	59,270,951	59,270,951	47,416,761	47,416,761	47,416,761	47,416,761	47,416,761	n/a
2.1	Lead IA (World Bank) agreed funding (US \$)		183,514	3,121,489	0	3,629,630	0	3,039,322	0	341,829	0	10,315,784
2.2	Support costs for Lead IA (US \$)		16,516	218,504	0	254,074	0	212,753	0	23,928	0	725,775
3.1	Total agreed funding (US \$)		183,514	3,121,489	0	3,629,630	0	3,039,322	0	341,829	0	10,315,784
3.2	Total support costs (US \$)		16,516	218,504	0	254,074	0	212,753	0	23,928	0	725,775
3.3	Total agreed costs (US \$)		200,030	3,339,993	0	3,883,704	0	3,252,075	0	365,757	0	11,041,559
4.1.1	Deductions of HFCs agreed under this Agreement (CO ₂ -eq tonnes)											2,830,814
4.1.2	Deductions of HFCs from previously approved projects (CO ₂ -eq tonnes)											12,555*
4.1.3	Remaining eligible consumption for HFCs (CO ₂ -eq tonnes)											TBD
4.2.1	Deductions of HFCs contained in imported pre-blended polyols agreed under this Agreement (CO ₂ -eq tonnes)											0
4.2.2	Deductions of HFCs contained in imported pre-blended polyols from previously approved projects (CO ₂ -eq tonnes)											0
4.2.3	Remaining eligible consumption for HFCs contained in imported pre-blended polyols (CO ₂ -eq tonnes)											TBD

* Noting that 8.78 mt (12,555 CO₂-eq tonnes) of HFC-134a phased down by the conversion project from HFCs to propane (R-290) and isobutane (R-600a) in the manufacture of commercial refrigeration appliances at Pattana Intercool Co. Ltd. (approved at the 82nd meeting) will be deducted from the Country's starting point for sustained aggregate reductions in HFC consumption once that point has been established (decision 82/80).

APPENDIX 3-A: FUNDING APPROVAL SCHEDULE

1. Funding for the future tranches will be considered for approval at the second meeting of the year specified in Appendix 2-A.

APPENDIX 4-A: FORMAT OF THE TRANCHE IMPLEMENTATION REPORTS AND PLANS

1. The submission of the Tranche Implementation Report and Plans for each tranche request will consist of four parts:

- (a) A narrative report, with data provided by tranche, describing the progress achieved since the previous report, reflecting the situation of the Country in regard to phase-down of Annex F substances, how the different activities contribute to it, and how they relate to each other, including, where applicable, activities related to energy efficiency approved in the context of HFC phase-down pursuant to decision 91/65. The report should include the amount of Annex F substances consumption reduced as a direct result of the implementation of activities, by substance, the alternative technology used and the related phase in of alternatives, to allow the Secretariat to inform the Executive Committee on the resulting change in climate relevant emissions. The report should also include quantitative information on the activities implemented and further highlight the successes, experiences, and challenges related to the different activities included in the Plan, reflecting any changes in the circumstances in the Country, and providing other relevant information. The report should also include information on and justification for any changes vis-à-vis the previously submitted Tranche Implementation Plan(s), such as delays, use of flexibility for the reallocation of funds during implementation of a tranche as provided for in paragraph 7 of this Agreement, or other changes;
- (b) An independent verification report on the Plan's results and the consumption of Annex F substances, as per subparagraph 5(b) of the Agreement. If not decided otherwise by the Executive Committee, such a verification of consumption data must be provided with each tranche request, covering all relevant years for which a verification report has not yet been acknowledged by the Committee, as specified in subparagraph 5(a) of the Agreement;
- (c) A written description of the activities to be undertaken during the period covered by the requested tranche including quantitative information, highlighting implementation milestones, the time of completion and the interdependence of the activities, and taking into account experiences made and progress achieved in the implementation of earlier tranches; the data in the Plan will be provided by calendar year. The description should include a reference to the overall Plan and progress achieved, as well as any possible changes to the overall Plan that are foreseen. The description should also specify and explain in detail such changes to the overall Plan. This description of future activities can be submitted as a part of the same document as the narrative report under subparagraph 1(a) above; and
- (d) An Executive Summary of about five paragraphs, summarizing the information contained in subparagraphs 1(a) to 1(c) above.

APPENDIX 5-A: MONITORING INSTITUTIONS AND ROLES

1. The Thailand National Focal Point for the Implementation of the Montreal Protocol (the national ozone unit (NOU)) of the Department of Industrial Works (DIW) within the Ministry of Industry, is responsible for managing and co-ordinating Thailand's Plan, including all phase-down activities and

measures controlling HFCs and sustainability of the consumption reduction targets achieved through the Agreement. The management and implementation of this Agreement will be undertaken by the project management unit (PMU) for the implementation of stage I of the Plan, which falls under the direct authority of DIW.

2. DIW, through its PMU and the NOU, will collaborate and co-ordinate with the Ministry of Finance (MOF) and the Customs Department to implement the import/control system for HFCs; review annual HFC import/export license applications; and establish and publish the annual import quotas for HFCs for the period 2027–2034.

3. In order to assist DIW in monitoring and evaluating the progress of Agreement implementation, the PMU and NOU will:

- (a) Update the HFC management information system (MIS) that captures and tracks all relevant and required data on the importation of HFCs on an annual basis;
- (b) Update the data on the actual amount of imported HFCs;
- (c) Monitor and report, in cooperation with the Customs Department, any incidents of illegal import of HFCs;
- (d) Monitor progress of HFC phase-down on the demand side, including activities relating to training and capacity-building and sub-project implementation;
- (e) Maintain the Plan's MIS;
- (f) Compile periodic progress reports of HFC phase-down plan implementation and HFC phase-down achievements for sharing with the Customs Department and MOF;
- (g) Prepare Tranche Implementation Reports and Plans according to the schedule set forth in Appendix 2-A;
- (h) Prepare other monitoring reports as required by DIW or other Government authorities and by Executive Committee decision, in coordination with the Lead IA; and
- (i) Carry out safety and technical review of all relevant activities undertaken under this Plan.

4. DIW along with its government partner agencies (including the Customs Department, the Ministry of Planning and Investment, and the Department of Alternative Energy Development and Efficiency on relevant energy-efficiency activities) will be responsible for reviewing PMU reports and data and instituting control and policy measures which facilitate HFC control and reductions according to the Agreement.

APPENDIX 6-A: ROLE OF THE LEAD IMPLEMENTING AGENCY

1. The Lead IA will be responsible for a range of activities, including at least the following:

- (a) Ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country's Plan;
- (b) Assisting the Country in the preparation of the Tranche Implementation Reports and Plans as per Appendix 4-A;
- (c) Providing independent verification to the Executive Committee that the Targets have been met and associated tranche activities have been completed as indicated in the Tranche

Implementation Plan, consistent with Appendix 4-A;

- (d) Ensuring that the experiences and progress are reflected in the updates to the overall Plan and in the future Tranche Implementation Plans, consistent with subparagraph 1(c) of Appendix 4-A;
- (e) Fulfilling the reporting requirements of the Tranche Implementation Reports and Plans and of the overall Plan as specified in Appendix 4-A for submission to the Executive Committee;
- (f) In the event that the last funding tranche is requested one or more years prior to the last year for which a consumption target had been established, annual Tranche Implementation Reports and, where applicable, verification reports on the current stage of the Plan should be submitted until all activities foreseen had been completed and HFC consumption targets had been met;
- (g) Ensuring that appropriate independent technical experts carry out the technical reviews;
- (h) Carrying out the required supervision missions;
- (i) Ensuring the presence of an operating mechanism to allow for an effective and transparent implementation of the Tranche Implementation Plan and accurate data reporting;
- (j) In case of reductions in funding for failure to comply in accordance with paragraph 11 of the Agreement, to determine, in consultation with the Country, the allocation of the reductions to the different budget items and to the funding of the Lead IA;
- (k) Ensuring that disbursements made to the Country are based on the use of the indicators;
- (l) Providing assistance with the policy, management and technical support when required; and
- (m) Timely releasing funds to the Country/participating enterprises for completing the activities related to the project.

2. After consultation with the Country and taking into account any views expressed, the Lead IA will select and mandate an independent entity to carry out the verification of the Plan's results and of the consumption of Annex F substances mentioned in Appendix 1-A, as per subparagraph 5(b) of the Agreement and subparagraph 1(b) of Appendix 4-A.

APPENDIX 7-A: REDUCTIONS IN FUNDING FOR FAILURE TO COMPLY WITH THE TARGETS IN THE AGREEMENT

1. In accordance with paragraph 11 of the Agreement, the amount of funding provided may be reduced by US \$7.26 per CO₂-eq tonne of consumption beyond the level defined in row 1.2 of Appendix 2-A for each year in which the Target specified in row 1.2 of Appendix 2-A has not been met, on the understanding that the maximum funding reduction would not exceed the funding level of the tranche being requested. Additional measures might be considered in cases where non-compliance extends for two consecutive years. Where the Country has failed to comply with the Agreement due to illegal trade, the reduction in funding would not be applied if the illegally traded controlled substances are seized and subsequently confiscated, destroyed, exported, or returned to the country of origin.

Annex III

SIMULTANEOUS IMPLEMENTATION OF THE HCFC PHASE-OUT MANAGEMENT PLAN AND THE KIGALI HFC IMPLEMENTATION PLAN IN THAILAND

	HPMP – stage III (indicative)*		KIP – stage I		HPMP+KIP combined cost (US \$)
Category of activity	Activity	Cost (US \$)	Activity	Cost (US \$)	
Training of technicians – cross-sectoral	Training of 15,000 RAC service technicians in good service practices for AC and refrigeration equipment	10,796,040			10,796,040
			MAC service technician training; large AC technician training	4,421,600	4,421,600
Training of large refrigeration service technicians	Training of large refrigeration service technicians using HCs and other low-GWP refrigerants*	1,565,000			1,565,000
			Training on large low-GWP refrigeration systems using ammonia*	936,000	936,000
End-user incentive programme	End-user incentive programme for replacing HCFC-based air conditioners with lower-GWP refrigerant-based energy-efficient alternatives**	3,900,000	End-user incentive (low-GWP equipment) for replacing high-GWP HFC-based air conditioners with lower-GWP refrigerant-based energy-efficient alternatives**	2,000,000	5,900,000
Awareness raising	Public campaign for end-user incentive programme	300,000			300,000
Training of customs and enforcement officers	Customs and enforcement training, including training of agents handling import logistics and storage	665,000			665,000
Strengthening of HCFC/HFC data tracking	HCFC data tracking system for data management and monitoring of HCFC supply and use	250,000			250,000
Solvents sector	Solvents training for fast-track adoption of alternatives to HCFCs	100,000			100,000
Technical assistance to SMEs			SME support for technology transfer for adopting low-GWP refrigerants in refrigeration	67,500	67,500
Upgrading training centres/training equipment			Training equipment support for commercial refrigeration	642,800	642,800

	HPMP – stage III (indicative)*		KIP – stage I		HPMP+KIP combined cost (US \$)
Category of activity	Activity	Cost (US \$)	Activity	Cost (US \$)	
Risk assessment for installation			Risk assessment for installation of flammable refrigerants for catalyzing adoption of A2L refrigerant-based air conditioners	70,000	70,000
Development of heat recovery ACs			Development of heat recovery air conditioners for maximizing energy use	202,400	202,400
Investment projects (manufacturing conversion)			Investment projects for conversion from R-410A to HFC-32 in AC equipment	1,007,815	1,007,815
Coordination and monitoring (PMU)	PMU for DIW and GSB for HPMP implementation #	844,000	PMU for DIW and GSB for KIP implementation#	784,155	1,628,156
Total		18,420,040		10,132,270	28,552,311
Percentage of total (%)		64.5		35.5	100

* Activities will be designed to avoid duplication and maximize synergies with KIP implementation.

**These activities will be implemented in coordination with the EERF project for promoting energy-efficient options. EERF funding would support the adoption of energy-efficient air conditioners. Together as a package, this would result in the accelerated adoption of lower-GWP refrigerants in AC applications.

#A portion of HPMP and KIP project management support activities would be allocated to technical assistance for the EERF project, as well as for the energy-efficiency project submitted pursuant to decision 94/60, respectively. Details are provided in the relevant project management unit sections of stage III of the HPMP and stage I of the KIP.

Annex IV

METHODOLOGY TO CALCULATE ADDITIONAL COMPONENT COSTS

Residential air-conditioning

2. The World Bank provided detailed information for each air-conditioner model manufactured by the six enterprises, including (by model) the number of units sold between 2023 and 2025; capacity (in BTU/hour); the current seasonal energy efficiency ratio (SEER, measured in BTU/hour/W) and target energy efficiency ratio (EER); and the current minimum energy performance standards (MEPS) applicable to the model (in BTU/hour/W). 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.

3. The Secretariat used the information provided by the World Bank to calculate the eligible additional component costs following the methodology described in table 4 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 air conditioners; for reasons of confidentiality, no information is provided on which enterprise manufactured the models, nor the quantity of each model manufactured.

4. Table 4 of document UNEP/OzL.Pro/ExCom/94/61 specifies three levels (E-low, E-medium, and E-high) based on which the additional component cost per unit is provided (US \$0/unit, US \$34/unit, and US \$45/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 of document UNEP/OzL.Pro/ExCom/94/61 and further described in document UNEP/OzL.Pro/ExCom/94/61/Add.1.

5. Two illustrative examples for the calculation of the eligible additional component incentive for air conditioners are provided in table 1.

Table 1. Examples for the calculation of the eligible additional component incentive for air conditioners

Particulars	Units	Reference	Model A	Model B
Baseline SEER to MEPS ratio	Current SEER/MEPS	A1	1.062	1.417
Target SEER to MEPS ratio	Target SEER/MEPS	A2	1.620	1.982
E-low	SEER (low)/MEPS	A3	1.000	1.000
E-medium	SEER (medium)/MEPS	A4	1.500	1.500
E-high	SEER (high)/MEPS	A5	2.000	2.000
Additional component cost	US \$/unit	A*	32.44	16.22
Eligible additional component incentive	US \$/unit	B=A*/3	10.81	5.41
Note: SEER is measured as BTU/hour/Watts				