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FURTHER ELABORATION ON THE OPERATIONAL FRAMEWORK ON ENERGY EFFICIENCY WHILE PHASING DOWN HFCS IN RELATION TO THE ELEMENTS LISTED UNDER DECISION 94/60(h)

Introduction

1. At its 94th meeting, the Executive Committee requested the Secretariat to develop a document, for its consideration at the 95th meeting, that further elaborates on the operational framework on energy efficiency while phasing down HFCs, specifically in relation to (i) costs for maintaining and/or enhancing energy efficiency in non-manufacturing activities covered in section I.3 of document UNEP/OzL.Pro/ExCom/94/61; (ii) costs for maintaining and/or enhancing energy efficiency for component manufacturers as indicated in document UNEP/OzL.Pro/ExCom/93/98 and heat-pump manufacturers; (iii) an operational framework for a revolving fund for end-user incentive projects; and (iv) criteria for considering projects for using the revolving fund set out in section IV of document UNEP/OzL.Pro/ExCom/94/61 (decision 94/60(h)).

2. In preparation of this document, the Secretariat consulted technical and financial experts on project activities relating to energy efficiency in refrigeration, air-conditioning and heat-pump (RACHP) applications, industry personnel dealing with component manufacturing, and bilateral and implementing agencies.

3. The report is divided into four parts:

(a) **Part A:** Operational framework for Multilateral Fund (MLF) grant funding for component manufacturing addressing components that could be covered including compressors, heat exchangers, and heat pumps. This section details the assumptions relating to the operational framework and funding modalities for additional activities along the lines of those

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[1] UNEP/OzL.Pro/ExCom/95/1

approved under decision 94/60, the conditions for funding energy-efficiency activities, and monitoring and reporting on project performance.

(b) **Part B:** Operational framework for MLF grant funding for non-manufacturing activities. This covers the following four groups of activities: technical assistance for small and medium-sized enterprises (SMEs); activities in the servicing sector; overarching support for sustainable capacity building on energy efficiency in RACHP applications; and preparatory funding. The section includes information relating to proposed funding level and processes for reporting on project performance.

(c) **Part C:** This chapter presents the details of a revolving fund that could be considered as an option to support energy-efficiency-related activities in end users while phasing down HFCs. The section covers operationalization of the fund, monitoring and evaluation, and project preparation among other factors.

(d) **Part D:** Recommendation.

PART A – MANUFACTURING OF COMPONENTS AND HEAT PUMPS

I. Manufacturing of compressors and heat exchangers

4. Component manufacturing contributes to improvements in the energy efficiency of equipment. Component manufacturing can be "in-sourced" or a "make option" (i.e., components can be procured by the equipment manufacturer at their own facilities for technical and commercial reasons), or "out-sourced" or a "buy option" (i.e., components can be procured from outside suppliers).[2]

5. For the purposes of this document, the component-manufacturing-related costs for compressors and heat exchangers are considered, noting that these are the typical components that would result in an improvement in equipment energy-efficiency, and that the Executive Committee requested the Secretariat to provide this information in decision 94/60(h)(ii).

I.1 Manufacturing of compressors (stand-alone)

6. Compressor manufacturers for refrigeration and air-conditioning (RAC) equipment continuously improve product design to achieve better energy-efficiency levels. The capacity of the manufacturing facilities and the technical capabilities of the different enterprises can vary. The enterprises that manufacture these components are typically large in size[3] and have the technical personnel and infrastructure required to design and develop new and more energy-efficient products using low-global-warming-potential (GWP) technologies. They often have technologies for future products, though commercial-scale production plans would be available once the market readiness/business case is established by the respective businesses.

Calculation of costs

7. The assumption used for the purposes of this document is a compressor manufacturer with a manufacturing capacity of 2 million compressors per year. For energy-efficiency improvements, the

[2] Equipment manufacturers' decision to "make" or "buy" would depend, *inter alia*, on manufacturing volumes, technical product development and manufacturing capabilities, business policy and strategy for sourcing components, and the availability and ease of sourcing the different components.

[3] Large-size compressor manufacturing facilities would include those manufacturing about 2 million or more compressors per year; while this is not a very definitive number, the size would indicate the capability of the compressor manufacturers.

estimated additional capital investment costs for different operations in the manufacturing process are given in table 1 below for RAC compressors in two separate columns.

8. Based on normal industry practices, it is known that compressor manufacturers develop new products with better performance characteristics, including better energy efficiency, well in advance of the time when they place those products on the market. The product's market launch is based on each compressor manufacturer's business strategy and commercial considerations (e.g., volume of energy-efficient components that are expected to be sold).

9. In light of the variations that exist among compressor manufacturers and their requirements (e.g., their existing capabilities, the existing infrastructure to design and develop energy-efficient compressors, testing facilities for energy performance), the additional cost of manufacturing compressors with improved energy efficiency must be assessed on **a case-by-case basis**. Costs can also differ across manufacturers of larger-capacity compressors such as those used in large commercial refrigeration equipment or large commercial air-conditioning (AC) equipment. Thus, the costs given in table 1 below represent the maximum funding that would be available to beneficiaries despite these variations.

Table 1. Additional investment costs for plants that manufacture 2 million compressors per year (US $)

Particulars	**Activities**	**Costs for compressors with a capacity of less than 3.52 kW [refrigeration equipment]**	**Costs for compressors with a capacity of between 1 TR[4] and 2 TR [AC equipment]**
Product design and development	Cost of technical personnel for design and development of energy-efficient compressor	350,000	350,000
Manufacturing-facility modification (Reciprocating)	Changes in tooling for compressor housing, crankcase, crankshaft and piston, cylinder head and suction-related components and other related modifications in the manufacturing facility and changes in motor manufacturing	2,150,000	n/a
Manufacturing-facility modification (Rotary/Scroll)	Changes in tooling for rotating parts, lubricant and cooling paths, valves, and other related modifications in manufacturing and changes in motor manufacturing	n/a	2,320,000
Prototype manufacturing and testing	Manufacturing of a prototype for a small manufacturing run and compressor calorimetry test and laboratory setup for high efficiency compressors, and certification (UL)	175,000	300,000
Total additional costs for a plant that manufactures 2 million compressors		**2,675,000**	**2,970,000**

10. In cases where manufacturers produce both ranges of compressors i.e., with a capacity of less than 3.52 kW for refrigeration equipment and 1 to 2 TR for AC equipment, the total funding would be equal to US $1,200,000 for the refrigerator compressor manufacturing line and US $2,320,000 for the air conditioner compressor manufacturing line; the costs for the refrigerator manufacturing line are lower than the values shown in the table above as the US $950,000 investment needed for a new motor line in the compressor manufacturing facility for refrigeration compressors can be shared between the refrigerator compressor manufacturing line and the air conditioner compressor manufacturing line. Thus, the total funding requirement for the modification of a manufacturing facility, for both refrigerator and air conditioner compressors, is US $3,520,000 in an integrated facility (i.e., US $950,000 lower than two separate facilities

[4] Tonnes of refrigeration: a unit of power used to describe the cooling capacity of AC systems.

manufacturing the different compressors). Further, the costs related to product design and development, and prototype manufacturing and testing would be assessed on a case-by-case basis.

"In-house" versus "out-sourced" manufacturing of compressors

11. The manufacturing facilities for compressors typically supply to different equipment manufacturers that do not have in-house compressor manufacturing. Compressor procurement is generally outsourced for a range of technical and commercial reasons. However, some equipment manufacturing facilities have internal sourcing of compressors through their own in-house manufacturing facility. In the past, for conversion projects funded in the context of ODS phase-out/HFC phase-down, when compressor manufacturing was internally sourced and the cost of compressor manufacturing conversion was included in the overall project costs, the incremental costs related to compressors were subtracted from the incremental operating costs when calculating the total incremental costs.[5] Following a similar practice, for an enterprise manufacturing equipment which requests funding for energy efficiency with "in-house" compressor manufacturing, the additional costs for the compressor component would be deducted from the additional cost calculations when using the methodology for estimating the incentive level described in document UNEP/OzL.Pro/ExCom/94/61.

12. In cases where the compressor manufacturer is selling compressors to equipment manufacturers (e.g., manufacturers of domestic refrigerators), the additional capital costs for the compressor manufacturer would be paid based on the maximum levels shown in the table above, after assessment of the additional costs needed. As the manufacturers of equipment would have multiple options for the procurement of compressors that would depend upon a range of commercial considerations, no adjustment relating to the compressor component costs is proposed for equipment manufacturers.

Funding conditions

13. Manufactured compressors can be sold on both domestic and export markets, and it is quite possible that different countries might not have national standards for compressor energy performance. Furthermore, the energy performance of compressors could be dictated by the equipment manufacturers whose equipment design would directly impact the equipment's energy consumption level.

14. It is also known that while the technology for manufacturing more energy-efficient components is available, the components' availability might be limited at the initial stages of introduction, making the components' prices higher. The product pricing strategy would be subject to market factors and commercial practices to be followed by the compressor manufacturers; with increase in manufacturing volumes, the price of compressors would decrease.

15. A minimum energy improvement of 10 per cent in compressor efficiency across all models covered in the project could be considered as eligible for funding. Priority funding could be provided for variable speed compressor technology and advanced compressor technologies that exceed a 20 per cent improvement over baseline compressor energy-efficiency performance.

16. This support is primarily aimed at strengthening the capacity of the compressor manufacturers to produce energy-efficient compressors and would target a specific product portfolio of compressors. However, the compressor manufacturers would continue to manufacture a range of compressors operating at different energy-efficiency levels, based on market conditions and demand for their different products. Therefore, the energy-efficiency performance of the compressors needs to be sustained and need to be monitored.

[5] Decision 26/36.

17. The energy performance of the compressors manufactured by the compressor manufacturers would need to be monitored by the national ozone unit (NOU) and the implementing agency over a period of **three years** from the date of completion of the project so that sustainable energy efficiency improvement can be demonstrated. The agreed level of funding provided to compressor manufacturers is based on the estimated sales of more energy-efficient compressors to be manufactured, and will be adjusted based on actual sales, essentially as described in document UNEP/OzL.Pro/ExCom/94/61.

1.2 Manufacturing of heat exchangers (stand-alone)

18. Heat exchangers can include both fin and tube heat exchangers (FTHXs) and microchannel heat exchangers (MCHXs) used in manufacturing evaporators and condensers for the different categories of equipment (e.g., domestic refrigerators and air conditioners). Manufacturing facilities for equipment using FTHXs could have component manufacturing facilities in-house. Manufacturing facilities for equipment using MCHXs may not have in-house component manufacturing since the manufacturing volumes for in-house facilities need to be very large and can be technically more complex.

Calculation of costs

19. The assumption used for the purposes of this document is FTHX and MCHX manufacturing facilities with an annual production capacity of 150,000 and 300,000 units respectively. For energy-efficiency improvements, the estimated capital investment for different manufacturing operations is given in table 2 below.

Table 2. Additional costs for heat exchanger manufacturing plants with a capacity of either 150,000 FTHX units or 300,000 MCHX units per annum (US $)

Manufacturing facility capacity	Description of activities	FTHX	MCHX
		150,000 per annum	300,000 per annum
Product design and development	Costs of technical personnel for design and development of energy-efficient heat exchangers	168,000	168,000
Manufacturing-facility modification*	For both types of heat exchangers: modifications in manufacturing line, design software and fin die For FTHX: new tube straightening and preparation machining, new hairpin tube expander, and jigs for circuiting and welding For MCHX: new tube preparation and new brazing furnace	240,000	540,000
Prototype production and testing	Manufacturing of prototype for a small manufacturing run, testing, and certification	50,000	50,000
Total		**458,000**	**758,000**

* In the case of FTHX, tube design changes for energy efficiency improvements require additional investment in dies. In the case of MCHX, changes relating to press for fins manufacturing, brazing furnace, and corresponding investments are required.

20. If the manufacturing capacity of the component manufacturer is different from the capacity set out in table 2 above, the cost assessment for the facility needs to be undertaken on a case-by-case basis. The cost listed under the "Manufacturing facility modification" line item in table 2 covers each production line with an annual capacity of up to 150,000 units for FTHX and up to 300,000 units for MCHX; funding for more than one production line per beneficiary would be decided on a case-by-case analysis. The costs for product design and development, as well as production and testing, are directly related to production capacity: lower production capacities incur lower costs, while higher production capacities result in higher costs.

21. Currently, manufacturers of equipment generally outsource the manufacturing of MCHX, while in the case of FTHX, manufacturers often have in-house manufacturing facilities. As explained earlier, if the manufacturing modifications for components is covered under MLF funding, the additional component

costs for conversion projects to manufacture energy-efficient equipment would be adjusted for the heat exchanger component costs.

Measuring performance

22. The energy-efficiency gains in the heat exchangers can be assessed through the improvement of the overall heat conductance. Overall heat conductance, or overall heat transfer coefficient, is defined as the heat transfer per unit area per unit change in temperature difference across the heat transfer medium, multiplied by the heat transfer area. This would be measured for the baseline product before the conversion and the improved product after the conversion to determine the scope of the performance improvement of the equipment.[6] A minimum energy improvement of 20 per cent in overall heat conductance across all models covered in the project could be considered as eligible for funding.

23. As in the case of compressors, the manufacturer of heat exchangers would manufacture a range of products based on demand from equipment manufacturers. The support provided through the project aims to build the capacity of the manufacturers to manufacture more energy-efficient heat exchangers. In light of this, the project performance could be measured based on the above-mentioned performance parameter (i.e., overall conductance) at the end of the project.

24. Similar to compressor manufacturing, if the heat exchangers manufactured are outsourced by equipment manufacturers, due to factors explained in the section on compressors, no adjustment relating to the heat exchanger component cost is proposed for equipment manufacturers. In the case of in-house manufacturing of heat exchangers where the equipment is already funded for energy-efficiency improvements, the additional component costs for the heat exchanger component would be adjusted and the incentive would be calculated as explained in document UNEP/OzL.Pro/ExCom/94/61.

25. Further, the energy efficiency improvement in heat exchangers should be monitored for a period of three years after project completion to demonstrate sustainable energy-efficiency improvement. Like the case of compressors, the agreed level of funding provided to heat-exchanger manufacturers would be based on the estimated sales of more energy-efficient heat exchangers to be manufactured, and will be adjusted based on actual sales, essentially as described in document UNEP/OzL.Pro/ExCom/94/61.

I.3 Manufacturing of heat pumps

26. The scope of this section focuses on air-to-air heat pumps used in residential and small commercial AC and heating systems. Such heat pumps are generally reversible in operation and can provide cooling and heating with a capacity of up to 3 TR. These systems are generally of the split design; and are mostly "mini-split" design in developing countries.[7]

Calculation of costs

27. The methodology for determining the incentive levels for heat pumps would follow the same basic methodology as for AC equipment and would be based on the costs presented in the paragraphs below. The additional capital costs for enhanced energy efficiency of the equipment are given in table 3.

[6] This overall heat conductance would be measured by the manufacturing facilities based on applicable technical standards and reported.

[7] The same parameters for performance and incentive level would apply when water is used on the heating side of the heat pump.

Table 3. Target energy performance levels for different equipment and additional capital costs

Equipment	Capacity (units per annum)	Additional capital cost (US $)	Additional capital cost per unit to achieve maximum performance level (US $/unit)
(a)	(b)	(c)	(d)=(c) (max) / (b) (max)
Residential AC that also operate as a heat pump	< 30,000	100,000	2.50*
	30,000 to 100,000	120,000	
	100,000	250,000	

* For 1.5 TR rated cooling capacity mini-split heat pump unit; additional capital cost may vary for different cooling capacities. This value is based on capacity of 100,000 units per annum and additional capital cost of US $250,000 (third row of the table).

28. The energy performance levels (E-low, E-medium and E-high) would be estimated as the ratio of these levels to minimum energy performance standards (MEPS) (RE-low, RE-medium, RE-high). This is to account for differences in the energy-efficiency performance ratios (Seasonal Energy Efficiency Ratio (SEER), Annual Performance Factor (APF), Heating Season Performance Factor (HSPF), Seasonal Coefficient of Performance (SCOP), and Cooling Season Performance Factor (CSPF)) used in different countries for measuring energy-efficiency performance.

29. Based on market information, specific energy efficiency standards are available in certain countries for reversible heat pumps. It is known that in many countries where AC is experiencing high growth, some of the key factors that influence consumer choice relate to cooling performance and energy efficiency. It is also known that the market for heat pumps is growing due to better environmental performance and energy considerations. Further, when equipment is designed for cooling and heating, the interventions related to energy-efficiency improvements in cooling would also invariably result in more energy-efficient performance when the equipment operates in heating mode. Therefore, the ratios of energy performance levels given above for cooling would be applicable for reversible heat-pumps, when a country does not have MEPS for heat pump performance. **In cases where the country has MEPS for heat pump performance, the improvement in energy efficiency would follow the same ratios as applicable for cooling for that equipment; the minimum cooling and heating performance would be considered for the assessment of the performance.** This would be part of the review of the energy-efficiency incentive scheme in accordance with decision 94/60(b)(ii).

30. Unlike refrigeration equipment, for which lower energy consumption (i.e., kWh/year/unit capacity) means better energy performance, AC has higher energy-efficiency levels when its energy-efficiency performance ratio (RE-low, RE-medium and RE-high) is higher. Table 4 provides information on the additional costs for achieving different energy-efficiency levels compared to the baseline level. The target levels (i.e., low, medium, high) are estimated inputs provided by industry experts and the costs relate to additional costs to achieve those levels of performance.

Table 4. Target energy performance levels for different equipment and additional component costs

Particulars	Residential reversible heat pumps (SEER/CSPF and HSPF/SCOP or APF (compared to MEPS level))	Additional component cost per unit (US $) ($C_e$*)
RE-low	1.00	n/a
RE-medium	1.50	34 (C_{medium})
RE-high	2.00	55 (C_{high})

Note: C_{medium} and C_{high} are incentive estimates for achieving the different levels of energy-efficiency performance shown in the previous column.

31. The performance of heat pumps deteriorates significantly in cold climates. A new class of "cold climate" heat pumps has emerged in limited regions of Article 5 countries which includes several new components to sustain extended operation in cold climates. Cold-climate heat pumps would typically yield significant energy-efficiency improvements beyond those presented in table 4 above. The costs for cold-climate heat-pump conversion needs to be analyzed on a case-by-case basis.

32. The methodology to be followed for assessing the incentive levels based on performance would be similar to the methodology for air conditioners explained in document UNEP/OzL.Pro/ExCom/94/61.

Conditions for the provision of incentives

33. No incentives would be available for equipment that does not have an established MEPS in the country. For countries that have a growing market share of heat pumps, but where the MEPS are only established for cooling performance, the comparison from the table above should focus only on the cooling performance; enhancement to heating performance will not be accounted for in the incentive mechanism.

34. The duration of the project is a key variable as the energy-efficiency levels of the equipment may rapidly change with time. If project implementation takes longer than three years from the end of the month during which the project is approved by the Executive Committee, the incentive would not be available; any funding provided to the enterprise participating in the project would be returned to the Fund. While the energy efficiency of the equipment can be verified upon completion of the project, the quantity of equipment manufactured for one year after completion of the project would be used to assess the energy-efficiency performance.

35. Enterprises would commit to manufacturing equipment with at least the target energy-efficiency performance after project completion, and to making best efforts to continue to improve the energy efficiency of those products beyond the project duration at their own cost. The performance of equipment covered under the project would be monitored for a period of two years from the date of completion of the project by the NOU and the agency. This would help in assessing the sustainable implementation of the energy-efficient technologies.

36. Governments would commit to periodically upgrading MEPS regulations, labelling programmes and awareness and information outreach activities to ensure that information on the target energy-efficiency levels under the project for the equipment is publicized among different stakeholders. Governments would also take steps to implement regulations to ensure that the manufacturing, import and sale of the equipment would at least achieve the target energy-efficiency performance levels, at the latest by three years from the date of completion of the project.[8] This is essential to ensure the sustainability of the project's target energy-efficiency levels by creating a level playing field among enterprises in the product market.

PART B – NON-MANUFACTURING ACTIVITIES

37. The non-manufacturing activities are categorised in four groups:

(a) Group 1: Technical assistance for SMEs that are funded under decision 94/60. It must be noted that the funding proposal presented below relates to technical assistance that would assist the enterprises in adopting energy-efficient technologies and is in addition to the funding that would be available related to additional capital and component costs;

(b) Group 2: Activities in the servicing sector;

(c) Group 3: Overarching support for sustainable capacity building on energy efficiency in RACHP applications; and

(d) Group 4: Preparatory funding.

38. The four groups of non-manufacturing activities were identified based on submissions made by countries under decisions 89/6 and 91/65, consultations with technical experts, consultations with the

[8] Ideally, implementing MEPS that would be at least equal to the target level for the project.

implementing agencies, and information available in the Technology and Economic Assessment Panel (TEAP) reports. The main criteria identified for the non-manufacturing activities for which support from the MLF may be considered are given below:

(a) The project is within the priority sectors being addressed by the country in its Kigali HFC implementation plan (KIP) and links to the KIP in terms of how the intervention would also result in sustainable capacity building to support HFC phase-down;

(b) The project contributes to strengthening or establishing minimum institutional, regulatory and technical infrastructure to record, measure and improve energy efficiency in cooling;

(c) The activities will remove barriers to maintaining and/or enhancing energy efficiency while phasing down HFCs;

(d) The project contributes to scaling up adoption of energy-efficient technologies using low/lower-GWP refrigerants; and

(e) The project requires seed funding that would be eventually complemented by operational business models in a sustainable way.

39. While it is recognized that the relevance of these criteria could vary across countries depending upon national industry structure and technology trends, the above criteria provide a useful basis for identifying the need for these activities at a broader level.

40. It is also recognized that an exhaustive set of activities is difficult to assess at this stage given the evolution of technologies and needs. Therefore, broad flexibility is proposed within certain groups of activities in different groups of non-manufacturing activities.

Group 1 activities: Technical assistance support for SMEs funded under decision 94/60

41. In the context of KIPs, SMEs[9] are largely engaged in manufacturing commercial refrigeration equipment and residential and commercial AC equipment, though to a limited extent, in domestic refrigeration equipment. Without support, these enterprises would face significant business continuity challenges, and this could result in delays in their project implementation relating to energy efficiency. This, in turn, would affect the pace of implementation of policies and regulations relating to energy efficiency for those applications in the context of HFC phase-down.

42. Specifically, the main challenges that SMEs face are:

(a) Limited technical capabilities in adopting new technologies that use low-GWP refrigerants and energy-efficient components both for manufacturing and for providing servicing support to customers;

(b) Limited financial capabilities and limited bargaining power with technology providers/large component suppliers;

(c) Geographic spread, which results in higher transaction costs for providing technical assistance and support; and

(d) Limited pool of qualified technical personnel to manage their operations.

[9] Currently, in the context of discussions relating to cost guidelines for HFC phase-down, issues relating to the definition of SMEs are under discussion.

43. The support needed for SMEs to handle the transition to energy-efficient, low-GWP refrigerant-based technologies is given below:

(a) Technical information exchange on emerging, energy-efficient, low-GWP-refrigerant-based technologies;

(b) Technical consultancy for SMEs for adopting energy-efficient technologies (e.g., product design including specific technical aspects, manufacturing processes and related training support, importance of after-sales service); and

(c) Continued support on low-cost solutions for energy-efficient equipment components.[10]

44. Regulatory interventions to enforce energy-efficiency standards for products targeted for conversion are essential. Further, if the approved conversion project, under the KIP and/or under enhancing energy efficiency in the context of HFC phase-down, covers the entire sector for that specific application, policies and regulations covering the whole sector can be less complicated to implement. Such policies and regulations are vital to supporting sustainable implementation. Therefore, supporting SMEs in a timely manner to adopt energy-efficient technologies is important. Over time, technological maturity will drive improvements in the ease of use of new technologies and lower cost of components, and SMEs will be better equipped to handle the challenges relating to technology change.

45. The technical assistance for SMEs will be granted to those SMEs that **commit to undertaking projects related to improving the energy efficiency of equipment under decision 94/60**. This would ensure targeted assistance to such enterprises. This assistance would include technical consultancy support for product design, and assistance for manufacturing energy-efficient equipment. It is proposed that **US $3,000 per enterprise be provided for this support, subject to a maximum of US $600,000 per country**. These funds would be in addition to the funds provided under the incentive mechanism pursuant to decision 94/60 for manufacturing conversions to energy-efficient equipment.

46. It must be noted that the size of SMEs could vary in different countries and/or for different applications. In many instances, the size of enterprises can be much smaller than the minimum capacity indicated in table 1 of document UNEP/OzL.Pro/ExCom/94/61. In light of this, additional capital costs under the incentive scheme defined in decision 94/60 would be estimated at the values given for the relevant commercial refrigeration equipment in table 1 of document UNEP/OzL.Pro/ExCom/94/61 if the minimum manufacturing capacity of the equipment is more than 500 unit for display case and 2,500 for chest freezers; for capacities lower than these limits, only additional component costs under the incentive scheme explained in document UNEP/OzL.Pro/ExCom/94/61 would be available. The additional component costs and the overall costs would be estimated based on the methodology approved under decision 94/60.

Group 2 activities: Support for servicing sector and capacity building for adopting energy-efficient technologies

47. Under KIP implementation, countries are expected to include policies and regulations for controlling and monitoring HFCs, and capacity-building activities for the servicing sector. Activities in the servicing sector contribute to the good installation, maintenance and servicing of equipment, minimizing the emission of HFCs and resulting in the energy-efficient performance of equipment.

48. The Executive Committee has taken decision 92/37 on the level of funding for HFC phase-down in the refrigeration servicing sector. The eligible activities to be implemented through this type of project support during HFC phase-down would also cover to some degree aspects relating to energy-efficient

[10] This includes elements relating to the design and use of such components as well as sourcing components in a cost-effective manner.

operation of the equipment, and this is also the case for ongoing HCFC phase-out management plan (HPMP) activities relating to the servicing sector.[11] Thus, activities undertaken to enhance energy efficiency in the servicing sector need to be implemented taking a holistic view of these different activities in order to maximize synergies and avoid duplication.

49. Taking into consideration the above, the following activities could be considered for the servicing sector to maintain and/or enhance the energy-efficient operation of equipment:

(a) Upgrading training content for servicing sector training to include energy-efficiency-related aspects (e.g., new electronic controls and new components that would result in the energy-efficient operation of equipment);[12]

(b) Providing additional support for training institutions and facilities to strengthen training infrastructure (such as training trainers in energy efficiency, and providing equipment relating to energy efficiency for the training of servicing technicians); maximizing synergies with KIP activities for the development of cost-effective training facilities and delivery of training activities;

(c) Providing support for institutional coordination with the relevant authorities responsible for energy efficiency to ensure that Kigali Amendment provisions are appropriately incorporated into energy-efficiency regulations (e.g., MEPS strengthening for RACHP equipment to include standards and other measures that would incorporate maximum GWP levels for equipment supply and demand);[13]

(d) Providing capacity building support for engaging financial institutions at national level in relevant activities for the adoption of energy-efficient technologies while phasing down HFCs and/or HFC-consuming RACHP equipment; and

(e) Conducting awareness and information outreach activities on energy-efficient equipment using alternative technologies, and providing information on energy-efficiency standards, labelling and other measures for RACHP equipment[14] to relevant stakeholders.

50. The support requirements for the servicing sector would vary for different countries depending upon the national-level assessments of servicing sector needs. For example, if there is a need for strengthening the certification system related to energy efficiency, or for the establishment of a product registry of energy-efficient, low-GWP, refrigerant-based RACHP equipment, countries need to be in a position to implement those activities with the available funding support.

51. The funding requirements for maintaining and/or enhancing energy efficiency could be considered at the levels indicated in table 5 below. The funding levels proposed are *inter alia* based on bottom-up estimates made by the Secretariat relating to the additional support, identified in paragraph 49 above, needed to maintain and/or enhance energy efficiency based on similar projects approved by the Executive Committee.

[11] Support is also available under decision 89/6 for energy-efficiency-related activities for low-volume-consuming countries under HPMPs.

[12] Support for providing equipment and tools for good servicing practices (that would also include energy-efficient operation of equipment) to service technicians who have been certified would be covered under the KIP and hence, separate funding is not proposed here.

[13] This support needs to be assessed in the broader context considering the levels of coordination available under the baseline scenario and support available from other MLF-funded activities for this coordination.

[14] This would include all RAC equipment.

Table 5. Proposed funding for servicing sector activities and capacity building for adopting energy-efficient technologies

HFC baseline consumption in servicing sector in mt	Funding proposed in US $
Up to 120 mt	US $120,000
>120 and up to 360 mt	US $200,000
> 360 mt	US $0.5/kg of 10 per cent of the HFC component of the baseline in servicing sector, over and above 360 mt* The total funding would be subject to a **maximum limit of US $700,000 per country.**

* For example, if the HFC baseline in servicing is 500 mt, 10 per cent of 140 mt (i.e., 500 – 360) would be used to estimate the cost in addition to US $200,000; this would be US $200,000, plus US $7,000 (calculated by 14 x 1,000 x 0.5) equaling to US $207,000.

52. As implementation of projects relating to energy efficiency while phasing down HFCs is at an early stage, better information on new activities will be identified with time. It is, therefore, proposed that the funding mentioned above be reviewed after an initial implementation period of three years, based on the experience gained.

Group 3 activities: Overarching support for sustainable capacity building on energy efficiency in RACHP applications

Centres for testing the energy efficiency of equipment

53. The main aspects linked to establishing and operationalizing regional/national testing centres and the type of support that is needed, including aspects relating to the sustainable operations of such regional/national testing centres, are provided in paragraphs 58 to 60 of document UNEP/OzL.Pro/ExCom/93/98.

54. The need for testing centres was highlighted during discussions held with the countries in network meetings and in consultations with bilateral and implementing agencies. The main need is to be able to test performance levels in order to regulate the energy efficiency of equipment using alternatives to HFC-based equipment entering the market. The importance of operational feasibility in terms of logistics, costs, time taken for the testing and certification process, and the overall viability of these centres, which are largely driven by throughput volumes (i.e., volume of equipment tested, certified), was also highlighted during these discussions.

55. The Executive Committee could consider a limit to the number of national testing centres and regional testing centres that could be funded.[15] Partial funding for infrastructure support for an existing centre that is undertaking testing could also be considered on a case-by-case basis.

56. Table 6 below provides an estimate of the investment required by testing centres for different categories of equipment. This could be the maximum funding for establishing testing centres. As mentioned in the paragraph above, partial funding for infrastructure support could also be considered based on an assessment of project-specific circumstances; this can be considered on a case-by-case basis.

[15] The funding requirement for national testing centres would be considered on a case-by-case basis using a viable business model for operationalizing those centres.

Table 6. Cost of establishing testing centres for different categories of equipment (US $)

Priority sector	Capital cost	Accreditation	Total
Domestic refrigeration and self-contained commercial refrigeration	600,000	10,000	610,000
Residential AC	600,000	10,000	610,000

***** Estimates based on the SEAD[16] Initiative Study, TEAP supplementary report for replenishment of the Multilateral Fund for the triennium 2024–2026. This was subsequently adjusted for the latest estimates for the costs.

57. If multiple categories of equipment are included, the total funding requirement for establishing the centre would be higher. The current proposed costs include two categories of equipment that are expected to have MEPS and energy-efficiency-measurement needs through a testing centre, and that would cover most of the equipment in different markets.

58. If the centre is established to provide regional support in multiple countries, the process for operating such a centre and using the test results would need to be negotiated and established. In this case, finalizing the relevant process and regulatory arrangements may require additional time and would require commitment from the different stakeholders involved (e.g., national regulators would have to agree to a process of using the regional center). Furthermore, logistical arrangements associated with the movement of equipment for testing and certification, or any relevant testing operations would need to be carefully designed.

59. The proposal for a testing centre should clearly demonstrate the viable and continuous operation of the testing centre and include technical personnel for operating the centre, the establishment of energy-efficiency standards with testing procedures, a business plan that covers the source and use of funds for the centre, and co-financing available for operationalizing the centre. In the case of a regional centre, commitment from the countries in the region must be provided in order for the proposal to be considered.

60. It is proposed that a center for testing energy efficiency equipment for each region of Africa, Asia and the Pacific, Europe and Central Asia, and Latin America and the Caribbean, could be considered for funding, provided the proposals are supported by a strong business model.

61. Future funding support for the testing centres would be reviewed after an initial implementation period of three years based on the experience gained.

Regional centres of excellence for sustainable cooling

62. Regional centres for promoting sustainable cooling that could serve different countries can be designed to provide sustained technical support for the implementation of energy-efficiency activities while phasing down HFCs. The objective of these centres is to provide capacity-building and technology transfer support to different stakeholders. Over time, these centres would also be able to acquire knowledge for the implementation of sustainable cooling initiatives.

63. It must be noted that these are specialized centres which would play a role in addressing a range of capacity-building and technology-adoption support activities; this is different from support for training and technical support provided under KIPs/HPMPs, which focuses on training technicians and other relevant stakeholders. It must also be noted that these centres can provide technical capacity-building support in a cost-effective manner that is customized to local requirements, and over time become knowledge centers that would support national/regional initiatives for achieving sustainable cooling.

[16] Super-efficient Equipment and Appliance Deployment

64. An illustrative list of activities that could be supported by these centres includes the following activities, noting that these should be complementary to the regular KIP/HPMP training and technical support activities:[17]

(a) Training experts/trainers on energy-efficiency best practices for the installation and servicing of RACHP equipment using different refrigerant technologies;

(b) Training experts/trainers on the enforcement of energy-efficiency-related policies and regulations;

(c) Providing technical support related to energy-efficient equipment, innovative design, and product manufacturing for SMEs, including providing support for the promotion of energy-efficient, low-GWP, refrigerant-based technologies with partner technology providers; and

(d) Monitoring national and/or regional MEPS development and implementation status, national and/or regional market information on energy-efficiency aspects relating to RACHP equipment, and national and/or regional market information on low-GWP energy-efficient HFC-alternative technologies in different applications and uses for future policy development and project interventions.

65. The main advantages of setting up these regional centres include:

(a) Locally available in-house infrastructure and technical support for the adoption of new/emerging low-GWP-refrigerant-based, energy-efficient technologies, particularly for small and informal enterprises, as well as support on policy matters relating to the Montreal Protocol. The regional centres could also provide training to develop local entrepreneurship for low-GWP-refrigerant-based products and support product research and testing for new products in different markets;

(b) Locally accessible infrastructure and technical personnel available to provide training and technical support to technicians, resulting in cost-effective delivery of training and technical support programmes;

(c) Networking with industry and service providers for better outreach on technologies (e.g., energy-efficient and safe performance of equipment using new technologies, network of equipment/component suppliers and users, network with regional training centers/ technical institutions for capacity building and support);

(d) Establishing local expertise to cater to national and regional market needs for project implementation based on an in-depth understanding of market barriers, technology availability and accessibility, local workforce capacity, and local environmental conditions; and

(e) Evolution of these centres into knowledge/innovation centres, over time, for continued support to local stakeholders on technical and policy issues including product design and local adaptation of technologies in a cost-effective manner (e.g., these centres could be used for demonstrating technologies by providers of equipment using low-GWP-

[17] The Secretariat used experience drawn from similar activities implemented in the past to provide technical support of a similar nature and information available from a similar centre of excellence in Rwanda, noting that some of these centres have a much wider scope of services (e.g., cold chain infrastructure support).

refrigerant-based technology) and support measures needed for MEPS development in those markets.

66. The proposed additional activities and costs of providing support to a centre, including equipment support and initial training support for technical experts and a select number of trainers, could be considered for a limited number of such centres at the maximum values given in table 7 below.

Table 7. Additional activities and costs of providing support to regional centres of excellence for sustainable cooling

Sector	Particulars	Cost (US $)
SME manufacturing support for energy efficient equipment	• Equipment for the design of energy-efficient systems and modelling tools • Development of training materials for systems design and modelling • Training of trainers on product development	110,000
Training for installation and servicing – for local assembly and installation	• Training material development • Training of trainers • Fully equipped training centre with simulators	150,000
Training of trainers for servicing and maintenance technicians to keep equipment operating at peak performance	• Training material development for trainers and modules for servicing technician • Training of trainers	50,000
Training on policy development and enforcement relating to energy efficiency	• Training material development for policy enforcement and policy development • Training of trainers	90,000
Total		**400,000**

Note: (1) It is assumed that the trainees participating in the training programmes would pay for travel, board/lodging and training material support at the sustainable cooling centre; the value of this would vary depending upon the number of trainees trained in different programmes. (2) If there is an existing centre, the funds relating to energy efficiency in the context of HFC phase-down could be provided for specific additional activities and these could be a combination of one or more of the above activities. (3) Additional activities (e.g., data management of energy-efficient equipment, data collection on existing equipment infrastructure for large commercial and industrial RAC equipment, testing and certification of equipment) could be carried out by the centre for an appropriate service fee depending upon the business model proposed and technical capacity.

67. As mentioned in document UNEP/OzL.Pro/ExCom/93/98 for such centers, these centres should have a strong business model for financial and business management for sustainable operations; consultations with different stakeholders highlighted that the creation of an "ecosystem that involves continuous learning and knowledge management" is critical for effectiveness of these centers. While some of the services provided by these centres could be funded through projects relating to KIP/HPMP and other relevant activities, these centers could also continue to operate through a service-charges approach for different activities.

68. Considerations similar to those for establishing regional testing centres would apply to establishing these regional centres of excellence for sustainable cooling. As with the testing centres, it is also proposed that a sustainable cooling centre for each region of Africa, Asia and the Pacific, Europe and Central Asia, and Latin America and the Caribbean, could be considered for funding, provided the proposals are supported by a strong business model.

69. Funding support for the sustainable cooling centres would be reviewed after an initial implementation period of three years based on the experience gained.

Group 4 activities: Preparatory funding

70. Project preparation funding would be required for projects under the operational framework for energy efficiency in order to develop a detailed plan for maintaining and/or enhancing energy efficiency in the context of HFC phase-down. Keeping in view the need to ensure quality projects on energy efficiency under the operational framework, project preparation funding at levels proportional to the funding provided for preparatory activities under decision 91/66 could be considered.

Preparation of a plan of action for energy efficiency through non-manufacturing activities

71. The funding levels in table 8 below could be considered for those countries whose stage I of the KIP has been submitted on or before the 96th meeting and which are interested in submitting a plan of action to enhance energy efficiency through non-manufacturing activities. The levels proposed below are based on the recent decision taken by the Executive Committee on the preparation of national inventories of banks of used or unwanted controlled substances and a plan for the collection, transport, and disposal of such substances (decision 91/66), where 50 per cent of the levels approved in that decision is proposed for developing a project plan for enhancing energy efficiency through non-manufacturing activities. It must be kept in view that the KIP preparation activities should have resulted in information on HFC consumption levels and other relevant information on the equipment consuming HFCs in the country.

Table 8. Preparatory funding for non-manufacturing activities under the operational framework for energy efficiency

HCFC baseline (ODP tonnes)	Project preparation funding as per decision 91/66 (US $)	Project preparation funding proposed (US $)
Below 1	70,000	35,000
Between 1 and 6	80,000	40,000
Above 6 and up to 100	90,000	45,000
Above 100	100,000	50,000

Preparation of investment projects relating to energy efficiency under decision 94/60

72. The following funding could be considered in the case of countries where KIP investment project preparation is ongoing and the KIP is expected to be submitted on or before the 96th meeting, or where KIP preparation is completed. For the preparation of individual investment projects under decision 94/60, the following could be used for KIPs to be submitted up to the 96th meeting:

(a) Up to four enterprises to be converted in a manufacturing sector: US $30,000;

(b) From five to 15 enterprises: US $30,000, plus additional US $5,000 per enterprise above four; and

(c) For 16 and above to be converted in a manufacturing sector: US $85,000, plus additional US $3,000 per enterprise above 15.

73. If the KIP is proposed to be submitted after the 96th meeting,[18] US $2,000 per enterprise for up to 15 participating enterprises and US $1,000 per enterprise beyond 15 participating enterprises could be considered, in place of US $5,000 per enterprise and US $3,000 per enterprise referred to in paragraph 72(b) and (c), respectively.

[18] In these cases, the KIP preparation process is expected to be underway, and the preparatory activities can be planned to include activities relating to project preparation under the energy efficiency component.

74. The maximum funding that can be provided to Article 5 countries for the preparation of energy efficiency in manufacturing, is based on their HFC baseline consumption in CO_2-eq tonnes as shown in table 9 below.

Table 9. Preparatory funding limits for investment projects

HFC baseline consumption in $CO_{2\text{-eq}}$ tonnes	Limits for preparatory funding in US $
Up to 1 million	50,000
1 million to 2 million	100,000
2 million to 8 million	140,000
8 million to 15 million	180,000
15 million and above	220,000

75. As mentioned earlier, integrated implementation of HFC phase-down activities with activities to enhance energy-efficiency would result in cost-effective project implementation and would maximize opportunities. Energy efficiency projects need to be designed in such a way as to ensure the adoption of an integrated approach to implementing both the energy efficiency components and the HFC phase-down components.

Conditions for the consideration of non-manufacturing project activities

76. To access funds relating to non-manufacturing activities, except for the preparatory funding, countries would need to fulfil the following conditions:

(a) The Government would establish an institutional coordination mechanism with relevant authorities responsible for energy efficiency to ensure that Kigali Amendment provisions are incorporated in the relevant provisions of energy-efficiency policies and regulations;

(b) The Government would confirm that MEPS would include provisions relating to the Kigali Amendment, such as limits on the GWP of substances that can be used in refrigeration and foam equipment, within five years, at the latest, from the date of approval of preparation funding for non-manufacturing activities; and

(c) The Government would ensure that project activities that are funded through non-MLF funding and MLF-funded activities relating to energy efficiency including those pursuant to decisions 89/6 and 91/65, would be taken into consideration when designing and implementing the proposed projects under non-manufacturing activities, and would ensure both the complementarity and non-duplication of funding.

77. Countries' proposals for non-manufacturing activities should be submitted in one comprehensive package related to energy efficiency while phasing-down HFCs. This should be submitted **before the end of 2026** covering the implementation plan for stage I of the KIP, otherwise it would be considered under stage II.

78. Implementation of MEPS is critical to ensure energy-efficient performance of equipment above specified levels and sustainable improvement of energy efficiency; thus, the project preparation proposal should include a plan for the implementation of MEPS for the relevant RACHP equipment, if MEPS are not already under implementation.

79. Strong mechanisms to ensure the integration of KIP and national climate action plans (NCAP), if available, need to be demonstrated in the design and implementation of project activities, noting that many countries are likely to have cooling action plans under preparation or implementation. This needs to be addressed by governments in their respective national project implementation plans for different cooling and relevant climate change related projects.

Reporting and payment schedule for the different project components

80. Table 10 below presents the proposed reporting process and payment schedules for all the relevant activities described in part B of the document.

Table 10. Funding for projects relating to non-manufacturing component under the operational framework for energy efficiency

For all non-manufacturing activities excluding project preparation support (Activity-output-based)	Reporting • Project outputs/outcomes for different activities would be monitored by the implementing agency and periodic reports would be provided by the agency; this would cover agreed activities included in the project including performance of the business plan where relevant • Enterprise-level verification for SMEs, as applicable, would be undertaken through a sampling method and a verification process for the achievement of targets in line with the decision 94/60[19] • Annual reporting on regulations relating to MEPS, labelling and other relevant measures for different product categories Payment • Per centage (e.g., 80 per cent) of total funding disbursed up-front upon project approval • Remaining to be paid on satisfactory achievement of project activity output indicators
Energy-efficiency project preparation funding	Reporting • Implementation plan for energy-efficiency activities under the operational framework for the consideration of the Executive Committee in line with the guidelines approved by the Executive Committee Payment • 100 per cent of total funding paid up-front to the agency

Estimation of energy efficiency gains in kWh and climate benefits in carbon dioxide equivalent

81. In the case of projects that cannot be directly linked to a conversion to energy-efficient technologies and/or targets for energy-efficiency improvement, the information on the project activities along with the need for these activities, the activities' outputs (e.g., number of respondents covered under awareness programmes, number of training programmes conducted and number of trainees trained) and broader impact based on a project review process could be considered by the Secretariat for project evaluation and monitoring. This would be similar to support provided for institutional strengthening and capacity building of service sector under HPMP/KIP which result in better ability of different stakeholders to manage transition to alternative technologies. These could include the following:

(a) Number of enterprises (including SMEs) provided consultancy support for energy-efficiency-related activities;

[19] This approach is proposed in the case of projects where SMEs are provided funding support for conversion projects. In the case of other non-manufacturing activities, the activities would be broad-based, covering a sector and would not have individual identified enterprises.

(b) Number of awareness workshops, outreach programmes and other technical assistance programmes on energy efficiency and number of participants;

(c) Number of training programmes conducted, and technicians trained on energy-efficiency-related aspects;

(d) Number of institutions that were provided equipment support for training on energy efficiency (e.g., regional sustainable cooling centres, testing centres);

(e) Number of demonstration projects and related measures implemented (e.g., codes of practice for energy efficiency through demonstration at specific locations like schools, or hospitals, green procurement that includes low-GWP refrigerant-based, energy-efficient equipment specifications);

(f) Regulations and other measures implemented for energy efficiency (e.g., MEPS, labelling standards, regulations on the import of energy-efficient equipment);

(g) Growth in market share for energy-efficient, low-GWP refrigerant-based equipment measured through market assessments done by the NOU in consultation with key national stakeholders;

(h) Growth in the engagement of financial institutions in terms of number of financial institutions working with the NOU/agency to support the adoption of low-GWP-refrigerant-based, energy-efficient technology and the number of training workshops undertaken for national financial institutions; and

(i) Number of new innovative services available to support the adoption of low-GWP-refrigerant-based, energy-efficient technologies.

82. The development and implementation of MEPS that include relevant provisions related to the Kigali Amendment for different RAC equipment is critical. This could be complemented through labelling programmes that identify the quality of refrigerant. Given that the NOU mandate focuses on controlled substances, a national coordination mechanism supported by MLF funding could be considered for the purpose of supporting energy-efficiency authorities. This coordination mechanism would evolve over time and its effectiveness could vary depending upon national situations. It is, therefore, useful to take the first steps during stage I of the KIP and make adjustments to the support needs based on experience gained during the implementation of the KIP and other related projects.

83. The savings in CO_2 emissions thanks to the adoption of energy-efficient equipment would be directly related to the carbon intensity (i.e., kg CO_2 emissions/kWh/year) of the sources of energy at the user level. The savings would be available on additional equipment entering the market as well as savings in energy through better operation and maintenance of the existing equipment. The energy source that the product will rely on, the energy consumption levels (driven by user characteristics), the price of electricity, and the combination of different cooling equipment (e.g., fan and air conditioner combination) would all add complexity to the calculation of kWh/year savings and CO_2 benefits through indirect emissions.

84. For new equipment entering the market, the energy consumption in kWh/year can be measured based on the energy consumption levels (i.e., design performance levels) and CO_2 emission levels can be calculated based on the national average carbon intensity of energy generation. The difference between these estimates and the baseline level of operation of that equipment would provide an estimated annual savings in CO_2 emissions.

PART C – ENERGY EFFICIENCY REVOLVING FUND FOR END USERS

Definition

85. A revolving fund is a type of financing instrument where seed capital is used to finance investments in specific initiatives and is replenished through the repayment of funds used for the investments. A revolving fund is a financial instrument that allows for the continuous funding of projects. This fund flows through a cyclical process and ensures sustainability and ongoing availability of funds for the intended purpose, for the multiple beneficiaries, in the long term. The revolving fund model works well for the projects of specific interest, with specific eligibility criteria, or type of beneficiaries. When the one-time financing is available for limited number of projects or beneficiaries, the revolving fund mechanism with the same initial fund could significantly enhance the impact as the impact is multiplied by the different beneficiaries participating in the fund. The revolving fund can serve as a platform for blended finance, thus offering loans to end-users at a lower interest rate vis-à-vis market commercial rate, or to finance projects that are feasible for the project financing, but for some reasons are not of the interest of the banks. This low interest rate is designed to make financing more attractive and accessible to the beneficiaries.

86. It must be noted that in the current framework, end users get limited grant funding support from the MLF to convert from controlled substances to alternatives. The primary form of support is through end-user incentive schemes and/or demonstration projects. While such projects do play a role in helping end users/industries to understand the cost-benefits of adopting the alternatives, experience in implementing these projects shows that the impact of such initiatives in scaling up adoption of such alternatives is limited.

87. A revolving fund is proposed to address this barrier by making available low-cost financing for such transitions at scaled-up level. This could result in additional scaled-up support to end-users to expeditiously adopt alternative technologies which, in turn, would help the country achieve HFC compliance objectives and at the same time, maximize the energy efficiency of the equipment.

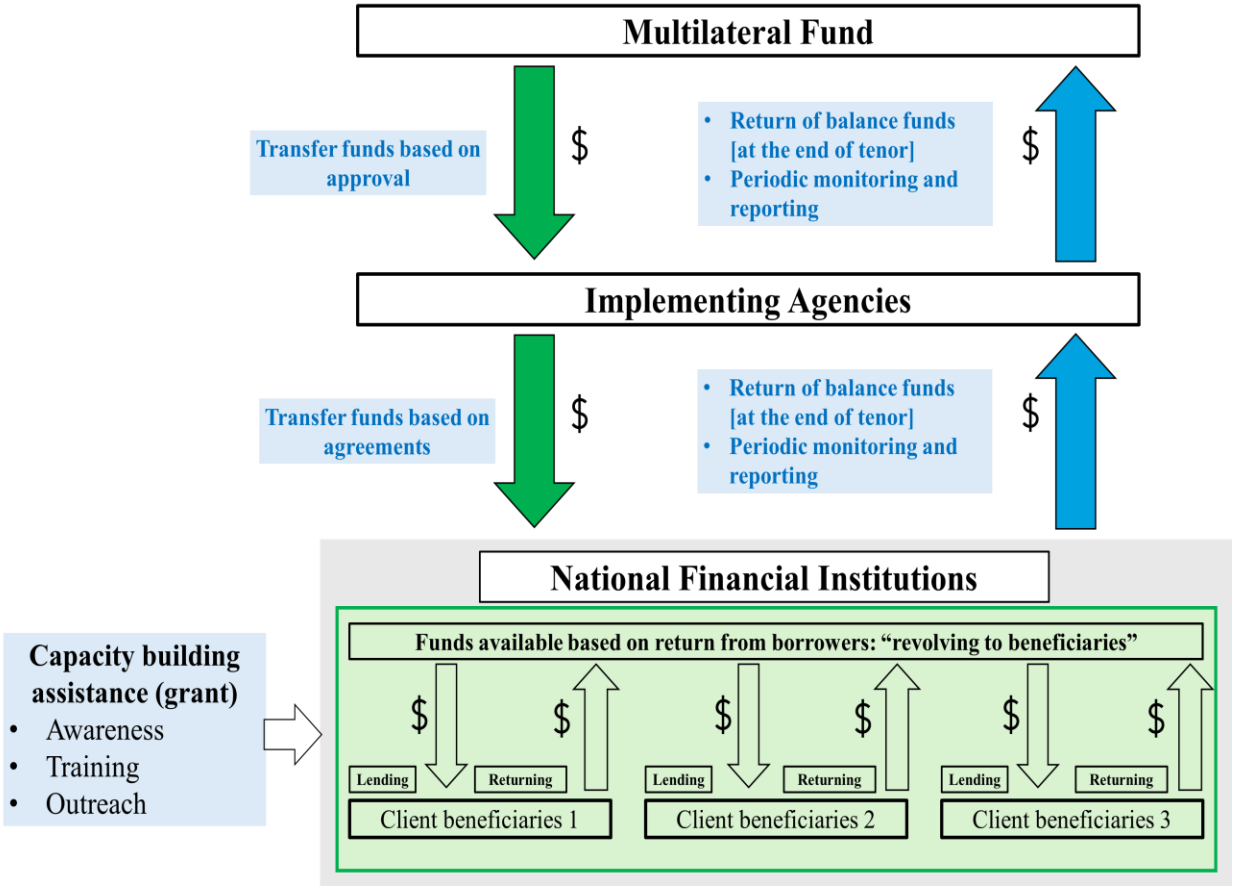
Objective

88. The objective is to use a sustainable financing mechanism, in this case an energy efficiency revolving fund (EERF), to achieve climate benefits by end-users through energy efficiency gains while phasing down HFCs.

Structure of the energy efficiency revolving funding

89. The flow of funds under the EERF is presented in figure 1 below.

Figure 1. Flow of funds under a Multilateral Fund EERF



Overview of the flow of funds in the EERF

90. An overview of the funds flow for EERF is given below:

Fund allocation and agreement setup for financing

(a) **MLF - Agency**: Based on the merits of the project proposal submitted by the agency with the endorsement from the Government, the Executive Committee approves the grant allocation to the implementing agency. The proposal submitted by the agency would include inter alia the target beneficiaries along with the potential funding levels needed for support, an overview of the project evaluation process including due-diligence procedures, and risk management process; experience in handling similar project with financing being an important parameter for evaluating proposal submitted by the agencies.

(b) **Agency - financial institution**: The agency, in consultation with the NOU, would set up contractual agreements with the financial institution (e.g., a national financial institution and Ministry in the country). These arrangements would include inter alia governance of the EERF at the level of institution, risk management framework and mitigating mechanisms including credit default risk, foreign currency risk, operating risks, and reporting requirements including impact of EERF.

(c) **Financial institution - end users**: The financial institution set up financial management mechanisms and designated accounts for the revolving fund to track disbursements and

repayments. The terms include eligibility criteria for the project including refrigerant technology choices as well as energy efficiency performance, interest rate applicable for the non-revolving fund portion, the repayment schedules, performance parameters (e.g., refrigerant technology choice, energy efficiency improvement) and monitoring and reporting requirements at the project level.

Fund release and disbursement

(a) **MLF - Agency**: Based on the Executive Committee decision, the Treasurer releases the grant allocation to the agency either (i) in full when all conditions are met, or (ii) in tranches based on specific conditions.

(b) **Agency - financial institution**: Based on the signed contractual agreement, in consultation with the NOU, the agency disburses funds to the financial institution based on signed or prospect end-user applications. The fund disbursement would be closely aligned the financing needs of the end-users.

(c) **Financial institution – end users**: Based on the submitted project proposals and in compliance with the eligibility criteria set by the agency/financial institution, the financial institution disburses funds to end users. The agency/financial institution may provide technical assistance, support, and guidance to the beneficiaries on fund usage and other relevant project parameters.

Fund utilization and monitoring

(a) **MLF - Agency**: The agency provides annual progress reports to MLF detailing the amount of funds disbursed to end users, the funded projects, the project impact, as well as the remaining balances not yet disbursed.

(b) **Agency - financial institution**: At all times, the financial institution will ensure proper documentation and compliance with the revolving fund requirements. Periodic reports on the progress of the funds received as well as the signed agreements will be shared with the agency along with the risk assessments and mitigating measures; due-diligence procedures for management of funds will be implemented by financial institution in accordance with guidance provided by the agency. The agency may perform oversight or periodic audits to assess the fund management process and fund's impact and ensure it aligns with the broader EERF objectives.

(c) **Financial institution - end users**: The financial institution will monitor the funds usage performance and, together with the agency, provide ongoing support to beneficiaries to maximise success. To mitigate risks, end users maybe requested to provide a comprehensive project progress report to ensure the revolving fund portion of the overall loan is coherent with the overall project implementation.

Fund repayment, replenishment, reallocation or redistribution

(a) **MLF - Agency**: At the end of the tenor, the information on balances available in the EERF would be provided to the Executive Committee by the agency. Based on the information, the Executive Committee could consider the following options:

(i) Transferring funds to projects approved by the Executive Committee by blending the funds back into MLF balances; this would be similar to the regular processes

followed by the Executive Committee when balances are returned by the agencies after project implementation;

(ii) Transferring these funds to a separate funding window which can be used for purposes identified by the Executive Committee for project implementation. This would be similar to the process used for additional contributions available for implementing enabling activities; and

(iii) Allowing the country to continue to use the remaining balances for similar subject to conditions approved by the Executive Committee.

(b) **Agency - financial institution**: The financial instruction collects repayments and updates the designated EERF accounts. In a timely manner and to ensure transparency, the financial institution will report back on the returned amounts, bad debts, and doubtful accounts as well as and coordinate with the agency to identify risks and offer solutions to mitigate defaults.

(c) **Financial institution** - end users: The beneficiaries will repay the loan to the financial institution according to the agreed schedule.

Target beneficiaries

91. The target beneficiaries of the EERF would be users / managers of equipment. These end users would vary at the national level, depending upon the priority sectors and applications in the specific country. Broadly, they can be categorized as follows:

(a) End users or service providers of RAC equipment. While the funds can be available to a wide range of end users (e.g., residential AC users, stand-alone commercial refrigeration equipment users).

(b) Beneficiaries with projects for replacing existing equipment with energy-efficient and low-GWP equipment should be treated on priority compared to those buying equipment for new installations (e.g., green field ventures for use of RACHP equipment).

(c) Providers of cooling as a service or large component suppliers for energy-efficient technologies (e.g., operations and maintenance enterprises engaged in installing and operating equipment) could be considered for support through these funds.

92. It must be noted that preference could be given for the technology options chosen under KIP for the respective country in different applications, particularly low-GWP refrigerant technologies and with maximum energy efficiency impact.

93. Annex I to the present document provides overall guidance on criteria for considering projects for financing with the EERF. Specific project categories would be based on national circumstances and overall guidelines for consideration of those projects defined by the nationally selected financial institution with the NOU and agency.

Duration/tenor of the revolving fund

94. EERFs can be structured for a specific duration to catalyze market activity, allowing for multiple borrowers to utilize the funds within this period; to begin with and keeping in view the broad payback from different categories of equipment, it is proposed that the Executive Committee could consider eight years as the initial duration of the EERF.

95. After this timeframe, once the markets are developed to finance commercial transactions, transactions at regular market rates may become more cost-effective and in demand, driven by the proven energy savings from using energy-efficient products. Thus, this mechanism accelerates the adoption of energy-efficient products and services, paving the way for sustainable market operations in the future. If at the end of eight years, it is felt that the duration of the EERF needs to be extended, this could be considered and approved by the Executive Committee.

Financial viability

96. Sufficient resources are needed to ensure the financial viability and sustainability of EERF. While the costs for managing the EERF need to be assessed through country and sectoral specific analyses for the proposed interventions, through discussions with experts, the Secretariat suggests that for a EERF to be successful, it should have a minimal funding of $20 million, financed by the MLF; this funding can be augmented with additional funding from donors and other resources. It must be noted that higher the levels of resources available through the EERF, the larger could be the impact of the EERF.

97. Working across multiple countries have an advantage of lowered transaction costs and shortened preparation time as well as harmonization across preparation, implementation, results monitoring using common templates and tools, if such arrangements can be expeditiously concluded. Experience shows that successful energy efficiency interventions will require not only financial support but also technical assistance, ranging from policy development, capacity building, communications, outreach and awareness raising. In this regard, the proposed financing facility needs to be designed to provide integrated and tailored support to each participating country.

98. In addition, at the programme level, the facility will promote knowledge generation and exchanges among participating countries, as well as with sharing knowledge with other countries and development partners to promote energy efficiency and HFC phasedown interventions (e.g., providers of cooling as a service).

Preparatory funding

99. Funding amounting to US $100,000 per country would be provided to the countries for project preparation activities for the EERF. This funding would be provided to agencies which can demonstrate experience in managing/operationalizing revolving funds, including energy efficiency-related revolving funds.

100. Given that this is a new financial instrument being tried under the MLF, to begin with, **no more than five preparatory funding proposals from agencies could be submitted on the understanding that two project proposals for EERF would be considered for funding.**

Overview of implementation process

Project submission and approval

101. The funding level for a country under the energy efficiency revolving fund needs to be determined based on the country's needs which should be justified in the project proposal submitted by the agency[20] on behalf of the country; the criteria for considering project submissions is presented in annex I and illustrative list of information to be included in the project proposal is detailed in annex II to the present document.

[20] Agency refers to implementing or bilateral agency implementing the project.

102. The project proposal prepared using the preparatory funding above for the EERF would be reviewed by the Secretariat and presented to the Executive Committee. The main criteria for assessment of project proposals for the EERF would include a reduction in HFC using equipment through the different projects funded, both actual and/or avoided HFC use in equipment covered in the project, energy efficiency gains achieved compared to baseline levels, policies and regulations in place or under development supporting HFC phase-down and energy efficiency, co-financing for achieving a multiplier effect on total outreach (e.g., with a 1:1 ratio of co-financing the number of clients supported through the project can be doubled), operational processes and risk management mechanisms for implementing the EERF drafted, estimation of kWh/year saved and CO_2 emissions (direct and indirect) avoided, and other relevant measures for adopting energy-efficient equipment while phasing down HFCs.

103. The project proposal should also include the details of the financial intermediary institution that would be managing the EERF and operationalizing the fund once approved. The fund manager could be a commercial bank, national industrial financial entity, or an established fund managing similar transactions with technical and operational capacity to manage these funds. Use of a financial institution will ensure broader outreach to different end users with a streamlined implementation process, attract private sector co-funding, leverage financial expertise in developing different funding instruments and in professional risk management / mitigation strategies.

104. The beneficiary of the EERF should not be accessing grant funds from other sources including MLF (e.g., grant from GEF for demonstration projects in certain applications, grant from MLF under end-user incentive programme) for implementing the project.

Operationalizing the EERF after approval

105. Once approved by the Executive Committee,[21] the agency in close coordination with the NOU would need to sign a revolving funding agreement (RFA) or equivalent with the financial institutional on operationalization of the EERF. The specific terms of the agreement would be defined by the agency in consultation with the financial institution and other relevant stakeholders. It must be noted that this arrangement may vary depending on the agency's internal policies and procedures, as well as the role of the NOU in facilitating such agreements.

106. The next step would be to establish the governance structure of the EERF by forming the governance body in line with the agency's internal policies and procedures and in consultation the NOU and the financial institution. This governance body would be responsible *inter alia* for ensuring the conditions of the approved funds are met, setting the fund's goals, defining criteria for the consideration of the projects under the EERF,[22] identifying gaps in market access to finance energy efficiency while phasing down HFCs and providing guidance on how the EERF can address those needs, collaborating with the government to ensure the needed energy efficiency laws and regulations are in place to support the adoption of energy-efficient technologies while phasing down HFCs, and defining the framework for due-diligence for management of the EERF.[23]

[21] The Executive Committee would consider the EERF proposals based on the evaluation of the proposal by the Secretariat; an illustrative list of different aspects that the Secretariat would use for to assess the project proposal is given in annex II to the present document.

[22] The criteria could include, *inter alia*, the type of appliances/project categories that would be prioritized, HFC consumption level, energy efficiency in terms of kWh/year saved, level of co-financing by the beneficiary, and other project specific benefits demonstrated in the project proposal. These would be designed keeping in view country specific requirements and conditions for the approval of the revolving fund by the Executive Committee.

[23] The operational aspects relating to the lending process would be based on the financial institution's experience and usual processes with appropriate adjustments as needed and as agreed with the agency and the NOU.

107. The EERF should be directed toward support for specific sectors or a combination of sectors where appliances are consuming HFCs and experiencing growth in HFC consumption over time,[24] keeping in view the national circumstances and HFC phase-down priorities.

108. The EERF could adopt a financing structure that includes alternative funding structures to maximize climate impact and scale-up financing (e.g., credit risk guarantee for energy-efficient new technologies, blended finance with other lending instruments, etc.). The governance body and financial institution, in consultation with the agency and NOU, should maximize opportunities for co-financing as this would result in a larger impact from the use of EERF on the adoption of energy-efficient low/ lower-GWP alternatives.

109. The tenure of the EERFs shall be determined based on national level needs and keeping in view the time taken to establish and operationalize the fund; to begin with, these funds could be established for a period of eight years; extension of this tenure could be considered based on a review of the performance that would be undertaken by the Executive Committee. At the end of the initial 8-year period, the need for a EERF for end users should be reevaluated keeping in view the market evolution of such products in the relevant countries; a detailed assessment on the way that the balance of fund available would be utilized would be based on guidance by the Executive Committee.

110. While the EERF is launched, targeted marketing and awareness campaigns along with capacity building activities for financial institutions, potential end users and other relevant stakeholders based on the national circumstances would be undertaken.

Monitoring and reporting

111. Project implementation will be monitored based on periodic project implementation reports and the results achieved, which will include Montreal Protocol specific monitoring parameters (e.g. energy efficiency gains, HFC phase down amount). The operationalization of the EERF will be monitored through annual progress reports. The process of review that is expected to involve the agency and the NOU and other national stakeholders would be defined during project implementation.

112. Technical and financial verification processes will be established for the funded projects. These would be established keeping in view the funding level approved along with the funding structure, risk profile of the project and the management costs of these processes. These procedures would be established in consultation with the agency and the NOU.

113. An evaluation of the performance of the EERF will be submitted in a report by the agency and NOU to the MLF with the submission of tranche requests for the approved KIP or on an annual basis from the date of approval, whichever is earlier. If the agency implementing the EERF is different from the agencies involved in the KIP activities, the NOU needs to establish a coordination mechanism among the agencies and ensure that the report on the performance of the EERF would be submitted in a timely manner.

Technical assistance and capacity building

114. The agency and NOU, in close consultation with the financial institution, should undertake activities for capacity building of financial institution personnel and outreach to raise awareness of the EERF, taking into consideration the following:

[24] The consumption trend of HFCs in applications need to be analysed and presented in the proposal; this could include a forecast for an appropriate period of time to demonstrate how funding energy efficiency improvement would contribute to the phasing down of HFCs in those applications supported through the project.

(a) Periodic consultative meetings will specifically cover how the goals of EERF can be achieved, the policies and guidelines for operationalising the EERF and other operational aspects relating to the EERF; these meetings would primarily be targeted at staff handling EERF in the financial institutions or similar entities, NOU staff and targeted beneficiaries.

(b) Awareness and outreach activities related to the EERF and how potential beneficiaries can access EERF funds, including technical information relating to RACHP applications particularly relating to lower/low-GWP alternatives. These activities could be undertaken with a combination of resources under different project components relating to KIPs as well as HPMP activities.

115. Total funding of US $100,000 could be made available for capacity building activities once the EERF is approved.

Risk mitigation and management

116. While an EERF mechanism offers substantial potential benefits, establishing an energy efficiency EERF in developing countries presents a unique set of challenges and risks that must be carefully managed and mitigated to ensure success.

117. The agencies must thoroughly assess political and economic instability, other risks and mitigation measures in the operationalising the funds. This is essential to safeguard against loss in total value of the fund given that this is a non-grant facility. Further, the MLF would monitor the implementation, and the agency would report on the performance of EERF to the Executive Committee in line with the relevant guidelines and provide inputs, if necessary, for action by the Executive Committee.

118. The financial institution is responsible for managing all risks associated with operationalization of the EERF including beneficiary credit risk, project performance risks and foreign exchange risks. The operational process for project management including credit evaluation of proposals, the audit and verification procedures and relevant foreign exchange risk management processes (e.g., foreign exchange risk hedging mechanisms) should be designed for management of these risks. Selection of a reputable financial institution with a strong track record in energy efficiency financing and consistently low default rates relative to other lenders is essential for managing credit default risks.

119. Conducting periodic monitoring and audits, technical and financial, would help in addressing the technical and financial risks relating to individual loans provided using the EERF. The frequency and coverage of these audits needs to be defined by the EERF governing body. The audit findings and specific observations need to be reviewed along with the relevant mitigating actions by the relevant institutions (e.g., financial institution, agency, NOU).

120. Using an existing EERF or equivalent that is operating in the country could also be a useful entry point to fast-track the operationalization of the EERF. Based on country-specific conditions and availability of funds that have aligned goals with the EERF, these opportunities could be utilized for operationalizing EERF.

Programme support costs

121. Noting the nature of activities relating to EERF, the programme support costs could be provided in the range of **7 to 8 per cent** of the total project funding, depending upon the total funding level.[25] Since the EERF would have a tenure of eight years, after this period, the PSC for renewed funds approved under the

[25] The reduction takes into consideration the decrease in efforts needed in future stages for the operational needs of implementing agencies relating to revolving funds.

EERF would be decided at a future date, depending on if the EERF tenor needs to be extended and the timeframe established for renewal.

PART D - RECOMMENDATION

122. The Executive Committee may wish to consider:

(a) Noting the information provided in document UNEP/OzL.Pro/ExCom/95/87 further elaborating the operational framework on energy efficiency while phasing down HFCs in relation to the elements listed under decision 94/60(h);

(b) For component manufacturers and heat pump manufacturers:

(i) Requesting the Secretariat to use the operational framework on energy efficiency while phasing down HFCs and apply the modality elaborated in paragraphs 7 to 25 and paragraphs 27 to 36 of document UNEP/OzL.Pro/ExCom/95/87, for component manufacturers and heat pump manufacturers, respectively, relevant to these projects, for an initial period of three years;

(ii) Agreeing using the funding window established under decision 94/60(c) for projects developed and implemented under the framework;

(iii) Noting that the framework is subject to subparagraphs (b)(ii), (f) and (g) of decision 94/60;

(c) For the three categories of non-manufacturing activities referred to in part B of document UNEP/OzL.Pro/ExCom/95/87:

(i) Requesting the Secretariat to use the operational framework on energy efficiency while phasing down HFCs and apply the modality elaborated in document UNEP/OzL.Pro/ExCom/95/87, specifically:

a) Paragraphs 43 to 46 for funding technical assistance support for small- and medium-sized enterprises funded under decision 94/60;

b) Paragraphs 49 to 52 for funding support for servicing sector and capacity building for adopting energy-efficient technologies;

c) Paragraphs 56 to 61 for funding one centre for testing energy efficiency of equipment, in each of the four regions: Africa, Asia and the Pacific, Europe and Central Asia, and Latin America and Caribbean;

d) Paragraphs 64 to 69 for funding one centre of excellence for sustainable cooling in each of the four regions: Africa, Asia and the Pacific, Europe and Central Asia, and Latin America and Caribbean;

(ii) That the operational framework on energy efficiency while phasing down HFCs would be reviewed after an initial implementation period of three years, based on the experience gained;

(iii) That any non-manufacturing projects submitted under decision 91/65 would be subject to the methodology and conditions in the operational framework in part B of the document;

(d) Providing funding for project preparation for projects referred to in subparagraph (b) and for those under decision 94/60, as well as subparagraph (c) above, as outlined in part B of document UNEP/OzL.Pro/ExCom/95/87;

(e) Requesting the Secretariat to establish a revolving fund for energy efficiency end-user projects and apply the modality elaborated in part C of document UNEP/OzL.Pro/ExCom/95/87, on the understanding that:

(i) Periodical updates to the agreed methodology will be proposed in light of the experience gained from projects reviewed and implemented under the operational framework;

(ii) Funding requests for projects should address the criteria described in annex I and the illustrative list of information to be included with project proposals in annex II of the document;

(iii) Agreeing an [augmentable] funding window of [US $xxx million] for projects developed and implemented under the energy efficiency revolving fund for end users.

Annex I

CRITERIA FOR CONSIDERING PROJECTS FOR FUNDING THROUGH THE ENERGY EFFICIENCY REVOLVING FUND SET OUT IN SECTION IV OF DOCUMENT UNEP/OzL.Pro/ExCom/94/61

Proposals for accessing funds relating to the Multilateral Fund Energy Efficiency Revolving Fund (EERF) would be evaluated by the Secretariat and presented to the Executive Committee for approval. The criteria for considering project submissions to implement an EERF are presented below.

The funding criteria to fund projects with the approved EERF would be defined by the governing body established to oversee the fund, keeping in view national priorities and circumstances, and would take into consideration the conditions attached to the approved funds as decided by the Executive Committee.

Sectors

End users consuming HFCs in commercial refrigeration, industrial refrigeration and residential and commercial air-conditioning (AC) would be prioritized. ***The revolving fund would not be used to finance transport refrigeration or mobile air-conditioning equipment***.

User categories

End users owning and/or operating different equipment identified in the sectors identified above and consuming HFCs could be covered.[1] Amongst the end users, those who are **replacing old equipment** using HFCs would be prioritized compared to those who are buying equipment for new installations that are based on HFC-alternatives.

Alternative refrigerant technologies

In the case of the commercial refrigeration and industrial refrigeration sectors, refrigerants used in replacement/new equipment should have a GWP of less than 150. In the case of residential and commercial AC, replacement/new equipment should be based on refrigerants with a GWP of less than 750. The technology options would be in line with those defined the Kigali HFC implementation plan implementation strategy. This would be subject to change based on specific national policies and technical developments for domestic and export markets.

Impact (direct emission and indirect emission)

The direct and indirect emission impact of the project in CO_2-equivalent tonnes and energy-efficiency gains resulting from project implementation in kWh/year would be the main impact parameters used to assess the project. In addition to this, other parameters that could be considered for project evaluation would include the impact on national development plans and priorities and sustainable development goals, the promotion of innovative approaches in refrigeration, air-conditioning and heat pump technologies and the scalability of the project at the national/regional levels.

Risk assessment

Here, the criteria would be the quality of the overall risk assessment and management framework including risk mitigation mechanisms and due-diligence procedures included as part of the submission.

[1] In both cases, the beneficiary should own the equipment.

Annex II

COVERAGE OF FUNDING PROPOSAL TO BE SUBMITTED BY BILATERAL AND IMPLEMENTING AGENCIES FOR THE REVOLVING FUND (WITH NATIONAL OZONE UNIT ENDORSEMENT)

This annex presents an illustrative list of information that would be presented by the agency for the revolving fund for the consideration of the Executive Committee. This proposal would be evaluated by the Secretariat and presented for the consideration of the Executive Committee.

- Identification of targeted sectors/subsectors along with estimated number of beneficiaries and fund allocation. This should include identifying potential number of individual end users and/or service providers who would be potential beneficiaries for the adoption of low-GWP, energy-efficient technologies; this should translate to business plan volumes that would determine the size of funding under the revolving fund requested in the proposal.
- Selection of the financial institution that would potentially participate in the project, along with the details of the steps followed in the identification of that financial institution. This could include a set of institutions amongst whom the one that could potentially implement the project can be identified.
- Substances (HFCs) consumed in baseline years and estimated consumption by the identified sectors/ end users. This would include initial charge and recharge of applications and the estimated reduction in HFC consumption expected to be achieved based on the estimated business volumes.
- An estimate of the energy consumption (KWh/year) of the applications in the relevant sector(s) and estimated energy savings (best estimates) based on the baseline energy efficiency performance of the equipment along with the expected improvement in energy efficiency.
- Estimated impact of the revolving fund in terms of direct and indirect emissions impact in CO_2-eq. tonnes; the potential range of impact (i.e., minimum to maximum) could be provided.
- A broad outline of processes that would be followed for safe and sound end-of-life disposal of equipment replaced with funding from the revolving fund and regulatory mechanisms available to support this process (e.g., recovery and re-use of HFCs and disposal-related regulations).
- An overview of the processes that would be followed for making available the revolving funds to the different target sectors/end users and proposed repayment process after implementation. This is a general overview and should include activities that would be undertaken to promote the utilization of the funds as well as capacity-building activities for the fund managers, national ozone unit (NOU), and governing body managing these funds.
- An overview of the process followed for risk assessment and risk management as part of the operationalization of the revolving fund. This should include a call option for return of balances in the revolving fund under extreme situations. The risk management should explain the different risks, expected impact and the mitigating mechanisms including credit risk of beneficiaries, exchange rate risks, and other risks relevant to operationalising the revolving fund.
- Overall policies and other measures available through the country's government to promote low-GWP-refrigerant-based, energy-efficient technologies. This should include Kigali HFC implementation plan (KIP) initiatives and how the revolving fund support would complement KIP implementation, and implementation plans for the minimum energy performance standards (MEPS) and labelling scheme for different categories of equipment.
- Estimated levels of co-financing from non-Multilateral Fund sources that would be available along with the methodology used for estimating the levels. In case of blended finance, explanation on how the safeguards are incorporated to ensure that the funds under the revolving fund are used for the intended for equipment for maintaining and/or enhancing energy efficiency while phasing down HFCs.

- A commitment from the NOU confirming that they would be following Executive Committee guidelines while utilizing revolving funds; Confirmation that these funds would complement other initiatives taken in the country and not overlap or duplicate.
- Utilisation fee on unused balances of the revolving fund transferred to the financial institution.
- A budget break-down for the first 36 months including planned technical-assistance and capacity-building activities[1] and the revolving-fund-related activities.

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[1] Some of the activities would include the development of procedures and standard documents, for example standard legal agreements, and tender and audit templates.