

**Montreal Protocol
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Nairobi, 22 October 2023**Thirty-Fifth Meeting of the Parties to
the Montreal Protocol on Substances
that Deplete the Ozone Layer**
Nairobi, 23–27 October 2023
Item 11 of the agenda for the preparatory segment¹
**Energy-efficient and low- or zero-global-warming-
potential technologies: outcomes of the workshop on
energy efficiency (decision XXXIV/3, para. 4 (a))****Outcomes of the 2023 workshop on energy efficiency******Note by the Secretariat****I. Background**

1. A one-day workshop on energy efficiency was convened in accordance with paragraph 4 (a) of decision XXXIV/3, on enabling enhanced access and facilitating the transition to energy-efficient and low- or zero-global-warming-potential alternatives during the implementation of the Kigali Amendment, adopted by the parties to the Montreal Protocol at their Thirty-Fourth Meeting. The workshop was held on Sunday, 22 October 2023 at the United Nations Office at Nairobi immediately prior to the Thirty-Fifth Meeting of the Parties to the Montreal Protocol, which will take place at the same venue from 23 to 27 October 2023.
2. The objectives of the workshop were to:
 - (a) share information, experiences and lessons learned,
 - (b) assess challenges related to ways of improving availability and accessibility to energy-efficient equipment and equipment using low- or zero-global-warming-potential alternatives during the implementation of the Kigali Amendment.
3. The workshop was split into five sessions, which addressed:
 - (a) The landscape of energy efficiency in the refrigeration, air-conditioning and heat-pump sector;
 - (b) Technologies – making energy-efficient equipment and equipment using low- and zero-global-warming-potential alternatives more available;
 - (c) Policy options for enhancing the adoption and uptake of energy efficient equipment with low- and zero-global-warming-potential refrigerants;
 - (d) Enabling policies for an integrated approach;

¹ UNEP/OzL.Pro.35/1.

** ** The present document is being issued without formal editing.

- (e) Closing remarks and wrap-up.
- 4. The following background documentation was made available by the Ozone Secretariat in advance of the workshop:
 - (a) A concept note and provisional programme (UNEP/OzL.Pro.Workshop.12/1);
 - (b) A background note about existing policies concerning interlinkages between phasing down HFCs and enhancing energy efficiency (UNEP/OzL.Pro.Workshop.12/2–UNEP/OzL.Pro.35/10).
 - (c) An information note with case studies of existing policies addressing interlinkages between phasing down hydrofluorocarbons and enhancing energy efficiency (UNEP/OzL.Pro.Workshop.12/INF/1–UNEP/OzL.Pro.35/INF/9)
- 5. The workshop featured 26 presenters and panellists and five session facilitators. Around 300 participants who attended the workshop in person included representatives of governments, experts in energy efficiency of refrigeration, air-conditioning and heat pump (RACHP) and cooling sector such as representatives of International Energy Agency, Alliance for an Energy Efficient Economy, Lawrence Berkeley National Laboratory and CLASP, representatives of industry associations, international and non-governmental organizations, academic institutions and other entities.
- 6. Sessions included presentations, panel discussions between various experts knowledgeable on subject matters and question-and-answer segments, with opportunities for participants to contribute through questions and comments addressed to the speakers. In addition, during its breaks, the workshop showcased eight e-posters with the aim of presenting a diverse range of applied policies and solutions covered in case studies of selected parties and organizations.²
- 7. All the presentations made at the workshop and the e-posters have been uploaded in the workshop portal³.
- 8. This note provides a summary of key discussion points and take-away messages that emerged from each session of the workshop.

II. Key points raised at the workshop

A. Session 1: The landscape of energy efficiency in the refrigeration, air-conditioning and heat-pump sector

9. Session 1 aimed to set the stage for the current energy efficiency discussion in the RACHP sector and the growing need for cooling, exploring barriers and potential solutions. It included four presentations covering the status of energy efficiency, opportunities and strategies for understanding refrigeration and air-conditioning energy efficiency, challenges in making efficient RACHP equipment with low- and zero-global-warming-potential refrigerants more accessible and widely adopted and the need for an integrated policy approach to energy efficiency in the RACHP sector. Key points raised included:

(a) There is significant potential to reduce direct and indirect climate impacts of the RACHP sector. Actions such as reducing cooling loads, promoting energy efficiency of equipment, refrigerant transition under the Kigali Amendment, and decarbonizing the electricity grid can lead to near-zero emissions from cooling by 2050. Technical solutions, financial resources and the political intent to tackle emissions from the RACHP sector already exist.

(b) However, limited accessibility of efficient RACHP equipment and technologies using low- and zero-GWP refrigerants especially in many Article 5 and low-volume consuming countries (who are mainly technology takers), limited available data and lack of an integrated policy planning, coordination and implementation are a hinderance to the realization of the RACHP sector's potential. Barriers exist specifically related to the lack of coordination between national ozone and national energy and climate authorities, lack of consumer awareness, higher initial cost of energy efficient appliances with limited or no access to financing, and mismatch of interest between electricity supply and demand, leading to a lack of investments in energy efficient technologies. Institutionalizing data collection, combining data from various sources, and its verification can enhance global and country-level policy and industrial actions, identify implementation capacity gaps, and guide the investments flows.

² UNEP/OzL.Pro.Workshop.12/INF/1–UNEP/OzL.Pro.35/INF/9.

³ <https://ozone.unep.org/meetings/workshop-energy-efficiency-2023/poster-session>

(c) An integrated approach to developing, strengthening, and implementing policies that encourage energy efficiency and Kigali Amendment compliance is key. Measures for accessing markets including in low-volume consuming countries need to be put in place. This requires systematically engaging stakeholders and leveraging existing financial mechanisms, including the Multilateral Fund of the Montreal Protocol (MLF). Forums to create synergies and to enable further discussions between importers and exporters play an important role in this regard. In addition, increasing operational efficiency of existing equipment by training operators, investing in research and development, creating relevant and precise databases of equipment are essential. Finally, for an integrated policy approach, multiple stakeholders and sectors need to be brought together, taking into account various national needs and agendas as well as industry concerns.

B. Session 2: Technologies – making energy-efficient equipment and equipment using low- and zero-global-warming-potential alternatives more available

10. Session 2 consisted of two consecutive panel discussions with experts in the manufacturing and servicing phases of the RACHP value chain. Panel 1 focused on manufacturing (product design, refrigerant choices, components, assembly sector and small- and medium-sized enterprises), while Panel 2 concerned servicing (installation, maintenance and operation practices). The discussions focused on measures needed to address those issues from the policy perspective to stimulate actions within the industry. The discussion was focused on the need to raise awareness about existing solutions, addressing accessibility problems, investing holistically in buildings and equipment, and creating a roadmap for alternative refrigerants, energy efficiency, equipment design, and safety enhancements.

11. The following key points were discussed in panel 1:

(a) Minimum energy performance standards (MEPS) and labelling can drive the market toward high-efficiency products, promote research and development, and save money. Regional approaches are needed for harmonizing MEPS and standards, standardized measurements, seasonal energy efficiency factors and technician certification. Market control and surveillance are important to advance energy efficiency efforts and can be done both at national and regional levels.

(b) Close collaboration between policy-makers and industry is essential for making regulations more sustainable and impactful. Here, industrial associations play an important role helping policy-makers optimize efficiency and adapt low-GWP solutions that suit the local conditions. Small- and medium-sized enterprises struggle to afford integrating energy efficiency improvements and innovations into their businesses and require targeted technical and financial assistance.

(c) The interplay between new technology, high efficiency, low-GWP and flammability requires development and adjustments of standards and capacity building. Technology roadmaps, led by National Ozone Units (NOUs), are essential for transitioning to low-GWP technologies, addressing flammability and capacity building. Governments can consider unified systems for standards, energy performance, training, and certification for installation and maintenance. Industrial policies should focus on production efficiency and market acceptance of new technologies. Challenges, such as equipment accessibility and readiness may require regional approaches. Government intervention is needed to address dumping of equipment, both from outside and within the country, to minimize high energy consumption trends.

12. Key issues raised in Panel 2 include:

(a) The servicing sector is essential for safety, maintaining energy efficiency over time and promoting technology access. Proper maintenance, including adequate charge, clean heat transfer surfaces and appropriate temperature setpoints, can contribute to up to 50% of energy conservation. Multiple energy-related faults in RACHP equipment installation and maintenance can be easily fixed by well-trained technicians. Technicians require continuous training including knowledge of new equipment designs. Service technicians require certification and access to necessary tools, possibly tax-free. The widely present informal segment of the servicing sector needs innovative approaches to build knowledge on servicing flammables and high-efficiency equipment.

(b) Improving end-user awareness about efficient appliance use is crucial, especially since end-users can help keep contractors and technicians accountable to maintain energy efficiency in aging equipment.

(c) Establishing a strong relationship between National Ozone Units and refrigeration and air-conditioning associations is essential for promoting energy efficiency. Such collaboration can help with establishing energy consumption baselines, collecting data for assessing and continuously

improving energy efficiency, conducting robust market surveillance at national and regional levels to monitor and validate equipment throughout its lifetime which is crucial for maintaining energy efficiency.

(d) An all-encompassing approach is necessary, involving various stakeholders, including the informal servicing sector, to address energy efficiency, equipment design, low-GWP refrigerants and safety comprehensively. Gender inclusion should be given a priority.

C. Session 3: Policy options for enhancing the adoption and uptake of energy efficient equipment with low- and zero-global-warming-potential refrigerant

13. In session 3, participants explored opportunities for promoting widespread adoption of energy efficient RACHP models using low- and zero-GWP refrigerants, overcoming the challenge of higher costs relative to traditional technologies. The session included four presentations on minimum energy performance standards and labelling, including regional harmonization, on incentive-based schemes (rebates, subsidies, credit schemes), on engaging government purchasing power through public and bulk procurement, and on cooling as a business model and other innovative approaches. The examples of their application were also discussed and featured in the accompanying e-poster sessions.

14. Session 3 provided the following key insights:

(a) Regional harmonization of MEPS as a key policy related to energy efficiency can reduce manufacturing costs and address challenges from differing standards across neighbouring countries. MEPS can serve as a benchmark for financing mechanisms, incentive schemes, public procurement policies and innovative business models. Developing and enforcing these standards is complex and requires market assessments, stakeholder engagement, legal frameworks, testing infrastructure and enforcement measures. Tools such as Model Regulation Guidelines based on the global experience, manuals, and tools on energy efficiency can be a starting point for launching or strengthening energy efficiency frameworks.

(b) Incentive-based market transformation relies on innovative financial mechanisms, communication campaigns, capacity building, and knowledge sharing. Technical assistance should enhance operator skills, and financing facilities can encourage the demand for highly energy-efficient equipment. While affordability remains a challenge, a case study from Ghana, where consumers chose to pay in cash despite the availability of financing options, demonstrates that there is potential to create demand for highly energy-efficient equipment.

(c) Energy-efficient appliances are often expensive when introduced into the market. This can be a barrier for consumers, but aggregate procurement programmes such as Buyers Clubs increase purchasing power and can reduce initial costs of equipment significantly. Cooling as a service (CaaS) models benefit various users of cooling equipment by reducing capital and operational costs.

(d) The insights and barriers identified in this session highlighted the importance of a multi-faceted, collaborative, and regionally harmonized approach to promote energy efficiency in the RACHP sector. Robust stakeholder engagement at national level is vital for the success of energy efficiency initiatives. Collaboration between government ministries and agencies dealing with energy efficiency and environmental matters is essential for policy integration and addressing overlapping policies. A holistic approach is needed, considering decarbonization, sustainability, quality of life, and circular economy aspects. Energy-efficient projects require long-term goals and regular and proper technical assessments to succeed.

D. Session 4: Enabling policies for an integrated approach

15. Session 4 delved on the importance of an integrated approach. It included three presentations on integrated policy approaches, including National Cooling Action Plans (NCAPs), lessons learned and ways forward, on building and urban design to reduce cooling load and for heat resilience, and on financing energy efficiency and sustainable RACHP.

16. The follow-up discussion emphasized the importance of holistic methods for reducing cooling demand and promoting both innovative and traditional sustainable strategies. The session also explored the integration, collaboration, and funding associated with NCAPs in line with the Paris Agreement.

17. Key takeaways from the session include:

(a) Integrated policy approaches are essential in many sectors involving RACHP. Joint projects on energy efficiency and refrigerant management are a good starting point for the

development of integrated policy approaches to energy efficiency of the RACHP sector. It also requires integrated funding actions. Identifying a coordinating body from early on is important. In many cases the authority that holds the responsibility for the implementation of the Montreal Protocol also acts as a central government body concerning cooling.

(b) NCAPs implementation in many countries offers valuable lessons. NCAPs, with detailed roadmaps, can identify areas for potential energy demand reductions and build governments' commitment to sustainable cooling. They can influence trends, open financial pathways, and guide policy measures such as MEPS establishment, adjustments to energy efficiency codes of buildings, and promoting energy-efficient equipment. Incorporating NCAP results into NDCs can further climate mitigation efforts globally.

(c) Building and urban design can reduce cooling loads and enhance heat resilience of urban areas. A comprehensive, science and behaviour-driven approach is needed to understand the synergy between buildings and their environment. Obtaining reliable data for an integrated approach to energy efficiency considering these aspects can be complex. Collaboration among building sector stakeholders from the outset, proper documentation and maintenance guides are important for maintaining efficiency of buildings.

(d) Accessing and deploying finance is a key challenge, especially in the RACHP sector. Financing indirect emissions reductions is complicated, as sources are scattered and involve many stakeholders as well as institutional mandates. Barriers encompass policy framework deficiencies, coordination gaps, knowledge shortfalls, access issues to finance, high costs, and risk perceptions related to emerging technologies. Comprehensive strategies should mix financial and non-financial options. Engaging the private sector is crucial for climate-friendly transformation in the RACHP. Local contexts, accessibility and the lifecycle of equipment have to be taken into consideration when developing financing mechanisms and incentives. Finally, there should be increased coordination of finance flows under the ozone and the climate regime.

E. Session 5: Closing remarks and wrap-up

18. Session 5 consisted of a panel discussion with representatives from parties who shared their key takeaway messages from the workshop:

(a) The primary hurdle for manufacturing and adopting RACHP equipment is their often-significant initial cost. Especially for small and medium enterprises this can be prohibitive, often deterring investment in these technologies. The rapidly changing landscape of energy efficient technologies requires knowledge sharing and capacity building as well as adequate training and mandatory certification for technicians.

(b) Within Article 5 nations, MEPS and labelling with robust verification processes are either lacking or not well harmonized. There is also underrepresentation of cooling in national priorities. In Article 5 regions, especially Africa, the market is dominated by less efficient but more affordable appliances, exported by countries where MEPS stringency levels have been increasing. Innovative solutions like Buyers Clubs, incentive schemes mentioned in the workshop could bridge the accessibility and cost gap.

(c) An integrated approach and system-thinking is needed at the country level, taking into account energy efficiency considerations in building, eco-design of products, as well as the energy efficiency performance of different types of refrigerants. This requires coordination among different government agencies, especially among stakeholders involved in climate and energy efficiency. Finding synergies and shared interest is essential to meet the expectation of different government officers and end users. Cooperation at the international level is also key to bring examples and lessons learned from different regions and countries.

(d) The financial assistance provided by the Multilateral Fund is not sufficient, and other funding sources are crucial to address an integrated strategy, including for instance the building sector, the full cold chain or transportation.

(e) Energy efficiency in the RACHP sector is complex and is built around different areas and aspects not within the control of Montreal Protocol policy makers. However, the success of the Montreal Protocol and its Kigali Amendment will depend on these different pieces coming and working together.