

**Montreal Protocol  
on Substances that  
Deplete the Ozone Layer**

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Workshop on energy efficiency  
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 provisional agenda for the preparatory  
segment\*

**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 held 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 technologies, adopted by the Thirty-Fourth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer. 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.
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 divided 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;
  - (e) Closing remarks and wrap-up.

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\* UNEP/OzL.Pro.35/1.

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 on existing policies concerning interlinkages between phasing down hydrofluorocarbons 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. The approximately 300 participants who attended the workshop in person included representatives of governments, experts in energy efficiency in the refrigeration, air-conditioning and heat pump (RACHP) and cooling sectors, such as representatives of the International Energy Agency, Alliance for an Energy Efficient Economy, Lawrence Berkeley National Laboratory and CLASP Collaborative Labeling and Appliance Standards Program, and representatives of industry associations, international and non-governmental organizations, academic institutions and other entities.

6. Sessions included presentations, panel discussions between experts on the subject matters being discussed and question-and-answer segments that allowed participants to contribute through questions and comments addressed to the speakers. In addition, during the breaks, eight e-poster sessions were held, showcasing a range of applied policies and solutions in case studies presented by selected parties and organizations.<sup>1</sup>

7. All the presentations made at the workshop, including at the e-poster sessions, have been uploaded to the workshop portal.<sup>2</sup>

8. The present note summarizes the key discussion points and takeaway messages that emerged from each session of the workshop.

## **II. Key discussion points and takeaway messages**

### **A. Session 1: Landscape of energy efficiency in the refrigeration, air-conditioning and heat-pump sector**

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

(a) There is significant potential to reduce the direct and indirect impact of the RACHP sector on the climate. Actions such as reducing cooling loads, promoting equipment energy efficiency, the refrigerants transition under the Kigali Amendment, and decarbonizing the electricity grid could 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) Limited accessibility of efficient RACHP equipment and technologies using low- and zero-global-warming-potential refrigerants, especially in countries operating under paragraph 1 of Article 5 of the Protocol (Article 5 countries) and low-volume consuming countries (which are mainly technology takers), limited available data and a lack of integrated policy planning, coordination and implementation hinder the realization of the RACHP sector's potential. Existing barriers specifically relate 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 mismatched interests of electricity supply and demand, leading to a lack of investments in energy-efficient technologies. Institutionalizing data collection and verification and combining data from various sources could enhance global- and country-level policy and industrial actions, identify implementation capacity gaps and guide investment flows.

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<sup>1</sup> UNEP/OzL.Pro/Workshop.12/INF/1–UNEP/OzL.Pro.35/INF/9.

<sup>2</sup> <https://ozone.unep.org/meetings/workshop-energy-efficiency-2023>.

(c) An integrated approach to developing, strengthening and implementing policies that encourage energy efficiency and Kigali Amendment compliance is key. Measures for accessing markets need to be put in place, including in low-volume consuming countries. This requires systematically engaging stakeholders and leveraging existing financial mechanisms, including the Multilateral Fund for the Implementation of the Montreal Protocol. Forums for creating synergies and enabling further discussions between importers and exporters play an important role in that regard. In addition, increasing the operational efficiency of existing equipment by training operators, investing in research and development and 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 from the policy perspective to spur action 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 road map for work on alternative refrigerants, energy efficiency, equipment design and safety enhancements.

11. The following were the key points discussed by panel 1:

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

(b) Close collaboration between policymakers and industry is essential for making regulations more sustainable and effective. Industrial associations play an important role in helping policymakers optimize efficiency and adapt low-global-warming-potential solutions to local conditions. Small and medium-sized enterprises struggle to afford the cost of 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 global warming potential (GWP) and flammability requires standards development and adjustment and capacity-building. Technology road maps, led by national ozone units, are essential for transitioning to low-GWP technologies, addressing flammability and building capacity. Governments can consider unified systems for standards, energy performance and installation and maintenance training and certification. 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 the dumping of equipment, both from outside and within the country, to help reverse the trend towards high energy consumption.

12. The main issues raised during the panel 2 discussion were the following:

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

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

(c) Establishing strong collaboration 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, and conducting robust market surveillance at the national and regional levels to monitor and validate equipment throughout its lifetime, which is crucial for maintaining energy efficiency.

(d) An all-encompassing approach involving various stakeholders, including the informal servicing sector, is necessary for addressing the issues associated with energy efficiency, equipment design, low-GWP refrigerants and safety comprehensively. Gender inclusivity should be a priority.

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

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

14. Session 3 yielded the following insights:

(a) Regional harmonization of MEPS, as a key policy related to energy efficiency, can reduce manufacturing costs and address the challenges presented by differing standards in neighbouring countries. MEPS can serve as a benchmark for financing mechanisms, incentive schemes, public procurement policies and innovative business models. Developing and enforcing such standards is complex and requires market assessments, stakeholder engagement, legal frameworks, testing infrastructure and enforcement measures. Tools such as the Model Regulation Guidelines developed by the United Nations Environment Programme United for Efficiency (U4E) initiative based on the global experience, manuals and tools relating to 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 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 to the market. This can be a barrier for consumers, but aggregate procurement programmes such as buyers' clubs increase purchasing power and can reduce the initial cost of equipment significantly. Cooling-as-a-service (CaaS) business models benefit users of cooling equipment by reducing capital and operational costs.

(d) Robust stakeholder engagement at the 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 for addressing overlapping policies.

(e) A multifaceted, collaborative and regionally harmonized approach is important for promoting energy efficiency in the RACHP sector. The approach should be a holistic one that considers decarbonization, sustainability, quality of life and circular economy aspects of the sector.

### **D. Session 4: Enabling policies for an integrated approach**

15. Session 4 delved into the importance of an integrated approach. It included three presentations, on integrated policy approaches, including national cooling action plans (NCAPs), lessons learned and the way forward; building and urban design to reduce cooling load and for heat resilience, including district cooling and heating; and financing energy efficiency and sustainable RACHP.

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

17. Takeaways from the session included the following:

(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 in the RACHP sector. Integrated funding actions are also required. Identifying a coordinating body early on is important. In many cases, the authority responsible for implementing the Montreal Protocol also acts as the central government body for cooling matters.

(b) NCAP implementation in many countries offers valuable lessons. NCAPs, when accompanied by detailed road maps, can identify areas of potential energy demand reduction and build government commitment to sustainable cooling. They can influence trends, open financial pathways and guide policy measures such as establishment of MEPS, adjustments to energy efficiency building codes and promotion of energy-efficient equipment. Incorporating NCAP results into nationally determined contributions can further climate mitigation efforts globally.

(c) Building and urban design can reduce cooling loads and enhance the 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 that considers such aspects can be complex. Collaboration among building sector stakeholders from the outset, proper documentation and maintenance guides are important for maintaining the efficiency of buildings.

(d) Accessing and deploying finance is a major challenge, especially in the RACHP sector. Financing indirect emissions reductions is complicated, as sources are scattered and involve many stakeholders and institutional mandates. Barriers include policy framework deficiencies, coordination gaps, knowledge shortfalls, finance access issues, high costs and perceptions of risk 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 sector. Local contexts, accessibility and equipment life cycle 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 climate regimes.

## **E. Session 5: Closing remarks and wrap-up**

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

(a) The primary hurdle for manufacturing and adopting high-efficiency RACHP equipment is the often significant initial cost. Especially for small and medium-sized enterprises, this can be prohibitive, often deterring investment in such 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) In Article 5 countries, 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 and incentive schemes could bridge the accessibility and cost gap.

(c) An integrated approach and systems thinking are needed at the country level, taking into account energy efficiency considerations for buildings, eco-design of products and the energy efficiency performance of the various refrigerants. This requires coordination among various government agencies and especially among stakeholders involved in climate and energy efficiency. Identifying synergies and shared interests is essential for meeting the expectations of government officials and end users. Cooperation at the international level is also key in gathering examples and lessons learned from various regions and countries.

(d) The financial assistance provided by the Multilateral Fund is not sufficient. Other funding sources are crucial for the development of an integrated strategy, including in the building and transportation sectors and across the full cold chain.

(e) Energy efficiency in the RACHP sector is complex and is built around various areas and aspects outside the control of Montreal Protocol policymakers; however, the success of the Montreal Protocol and its Kigali Amendment will depend on those various areas and aspects working together.

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