



## WORKING PAPER

# Financing Energy Efficiency under the Montreal Protocol

## Abstract

**The Kigali** Amendment to phase-down HFCs was adopted only when there was a clear understanding between Parties to support improvements in energy efficiency in Article 5 countries to enhance the climate benefits of an HFC phase-down. Operationalizing energy efficiency is, therefore, crucial to strengthen the Montreal Protocol and maximise the climate benefits of the Kigali Amendment. While there is consensus on the importance of energy efficiency, there is currently a gridlock on integrating energy efficiency along with the refrigerant transition. At the core of this gridlock is the absence of a cost factor for energy efficiency and associated cost calculations as well as the inability of the multilateral fund (MLF) to the Montreal Protocol to receive outside funding for energy efficiency.

In this working paper, we argue that MLF has the experience and tools to deal with climate benefits – Climate Incentives and Multilateral Fund Climate Impact Indicator (MCII) – that need to be repurposed to fund energy efficiency.

We propose that the ExCom and the Parties to the Montreal Protocol consider the following:

1. Develop an Energy Efficiency Incentive (EEI) to support the energy efficiency enhancement along with HCFC and HFC phase-down. The EEI could be a certain percentage above the cost-effectiveness threshold.
2. The EEI should be provided for a global MEPS. Projects meeting and exceeding this MEPS should be eligible for EEI. For example, the global MEPS in 2030 could be at least the EER of best available technology available today.
3. The EEI should be applicable for fast phase-down of HFCs than those agreed in the Kigali amendment.

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# 1. Introduction

**The Montreal** Protocol on Substances that Deplete the Ozone Layer (hereafter Montreal Protocol) was established to protect the ozone layer by a global phase out of ozone-depleting substances (ODS). The Kigali Amendment to the Montreal Protocol (hereafter Kigali Amendment), that came into effect in January 2019, expanded the scope of the Protocol to reduce the global warming impact from use of hydrofluorocarbon (HFC) gases used commonly as refrigerants. Implementation of the Kigali Amendment is projected to avoid greenhouse gas (GHG) emissions of 2.8–4.1 Giga tonnes of carbon dioxide equivalent per year (GtCO<sub>2</sub>e/year) by 2050 and 5.6–8.7 GtCO<sub>2</sub>e/year by 2100.<sup>1</sup> This is expected to abate up to 0.5°C of warming by the end of the century.<sup>2</sup> The Montreal Protocol is thus a key multilateral instrument to combat the climate crisis.

While HFCs have high values of global warming potential (GWP), for Refrigeration, Air Conditioning and Heat Pump (RACHP) applications, 80% of global warming impact is from indirect emissions (CO<sub>2</sub> and black carbon emissions from fossil fuel electricity generation). Thus, the direct emissions or the use/release of HFCs and hydrochlorofluorocarbons (HCFC) constitute about 20% and is decreasing.<sup>3</sup>

The International Energy Agency (IEA) projects that through more stringent minimum energy performance standards (MEPS) and measures such as labelling, the average energy efficiency of the stock of air conditioners (AC) worldwide could be more than doubled between 2018 and 2050. This will reduce energy demand from the cooling sector by half and avoid GHG emissions equivalent to 500 million tonne CO<sub>2</sub>e/year. This would also be in line with the CO<sub>2</sub> reduction trajectories to meet the 1.5°C target of the Paris Agreement.<sup>4</sup>

Integrating energy efficiency and refrigerant phase-down has added climate benefits. According to analyses by the Lawrence Berkeley National Laboratory (LBNL), the world can avoid GHG emissions equivalent to 210–460 GtCO<sub>2</sub>e over the next three decades through a combination of efficiency improvements and refrigerant transition. This would be possible if, starting in 2030, all stationary air conditioning and refrigeration equipment were replaced with the highest-efficiency and climate-friendly refrigerant technologies available in 2018. They further stated that two-thirds of the avoided emissions are due to energy efficiency and a third is from the transition to low-GWP refrigerants.<sup>5</sup> Rapid introduction of highly energy-efficient appliances alongside a phase-down of HFCs, therefore, will double the climate benefits of the Kigali Amendment.<sup>6</sup>

The Technology and Economic Assessment Panel (TEAP) further makes a case for integrating energy efficiency under the refrigerant transition by highlighting this as an opportunity to:<sup>7</sup>

- (A) Coordinate energy efficiency with HCFC phase out and HFC phase-down in Article 5 countries. The in-depth knowledge of RACHP technologies held within the “Montreal Protocol family” can strongly enable this combined reduction of direct and indirect GHG emissions.
- (B) Enable industries, Multilateral Fund (MLF) and the implementing agencies to work together and leverage existing synergies related to redesigning equipment and retooling manufacturing lines. the significance of coordinating energy efficiency with HCFC.
- (C) Avoid a large installed base of low energy efficient equipment, which in the long term will have redirected valuable electricity capacity from other uses. The economic disadvantage could last for decades due to the long product lifetimes of cooling equipment.
- (D) Support the development and enforcement of policies and regulations to avoid the market penetration of low efficiency RACHP equipment which in turn could stop environmentally harmful dumping and limit these economic impacts.

In fact, the opportunity to reduce GHG emissions substantially has been clearly recognised and embedded into the Kigali Amendment. In this respect, two decisions were adopted as a part of the Amendment in 2016:

- Decision XXVIII/2 requested the Executive Committee (ExCom) to develop cost guidance associated with maintaining and/or enhancing the energy efficiency of low-GWP or zero-GWP replacement technologies and equipment, when phasing down HFCs, while taking note of the role of other institutions addressing energy efficiency, when appropriate; and,
- Decision XXVIII/3, which deals specifically with energy efficiency, requested the TEAP to review energy efficiency opportunities in the RACHP sectors, invite parties to provide the Panel with relevant information on a voluntary basis and request the Panel to assess any information provided and report on the outcome of its efforts to the 29th Meeting of the Parties (MOP, 20-24 November 2017).<sup>8</sup>

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Since 2016, TEAP has submitted four reports on energy efficiency<sup>9</sup> and multiple rounds of discussions have happened at the ExCom and MOP. A key focus of these discussions has been to develop cost guidelines for HFC phase-down with considerations for energy efficiency. However, so far, there are no guidelines to operationalize the decisions on energy efficiency. At the 84th meeting of the ExCom in 2019, it was agreed that the energy efficiency cost guidelines will be discussed separately from the HFC cost guidelines, even though energy efficiency is one of four eligible incremental costs.<sup>10</sup> In the most recent meeting of the ExCom, held in June 2021, decisions related to financing energy efficiency was deferred to the 87th Meeting.<sup>11</sup> At the moment, however, the issue of financing energy efficiency is being deliberated in terms of mobilising funding from outside financial institutions. However, this too has been a challenge due to limited opportunities to access funding for energy efficiency enhancement from many of the climate funds.<sup>12</sup>

Progress on energy efficiency enhancement under the Montreal Protocol has been slow, particularly in terms of the modalities of operationalising funding. Deliberations so far have attempted to identify sources of such funding externally without necessarily leveraging existing opportunities within the Montreal Protocol. The ExCom decisions clearly indicate that the Parties are struggling to come to a consensus on how to fund energy efficiency improvements in Article 5 countries.

Operationalizing energy efficiency is crucial to strengthen the Montreal Protocol and maximise the climate benefits of the Kigali Amendment. Through this working paper, we endeavour to resolve some of the sticking points and suggest a methodology to operationalize energy efficiency decisions. A key motivation for this proposal is the fact that the MLF has the capacity and experience to fund energy efficiency enhancement and the belief that this may be the most efficient approach. It is important to remember that the Amendment to phase-down HFCs was adopted only when there was a clear understanding between parties to support improvements in energy efficiency in Article 5 countries to enhance the climate benefits of an HFC phase-down.<sup>13</sup>

## 2. Decisions on energy efficiency at Montreal Protocol

### 2.1. ExCom & MOP decisions on energy efficiency

**The Montreal** Protocol has been considered one of the most successful international agreements with close to two-hundred member countries complying with and achieving its targets. The Kigali Amendment of 2016 is considered a landmark deal as it looked beyond ozone depleting chemicals into gases that are active contributors to global warming. The Kigali Amendment has also considered energy efficiency as an important element of countries' phase-down plans, an element not considered in the earlier iterations of the Montreal Protocol. However, this is not to say energy efficiency in the context RACHP systems was never considered under the Protocol. In the following sections, we present a chronological analysis of discussions at the MOP and ExCom on energy efficiency.

A critical outcome of this assessment, as you may observe, will be the shifting perceptions on energy efficiency from being disincentivised, to being added to funding criterion, and being recognised as a requirement under the Kigali Amendment (albeit not binding requirement).

#### 2.1.1. Pre-Kigali Amendment (1994 – 2016)

The Montreal Protocol has had an ambivalent attitude toward energy efficiency. In fact, in the early years, the MLF deducted any costs towards energy efficiency improvement under the pretext of technology upgrade. To this end, at the 12th Meeting of the ExCom in 1994, consideration was given to the Total Equivalent Warming Impact (TEWI) in selecting an alternative technology for chillers. This included both direct effects (refrigerant GWP) and indirect effects (system energy efficiency) and impacts on human health and safety.<sup>14</sup> But energy savings, said the ExCom, should be taken into consideration when calculating the incremental costs of replacement.<sup>15</sup> That is, the savings from the energy efficiency should be deducted from the incremental costs. This was a clear disincentive for chiller projects to improve their energy efficiency, an observation made previously as well.<sup>16</sup>

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The attitude of the Protocol towards energy efficiency changed with Decision XIX/6 that came thirteen years later in 2007, in relation to the accelerated phase-out of production and consumption of HCFCs. Under this decision ‘energy use’ was added as a funding criterion.<sup>17</sup>

Decisions at the 60th<sup>18</sup> and 74th<sup>19</sup> Meeting of the ExCom (in 2010 and 2015 respectively) provided funding of up to a maximum of 25% above the cost-effectiveness threshold where low-GWP alternatives were introduced in stages I and II of the HCFC Phase Out Management Plans (HPMPs). Although this was not for energy efficiency, it can be a valuable experience for MLF to draw from while designing a funding guidance for energy efficiency enhancement under the Kigali Amendment.

## 2.1.2. Kigali Amendment and after (2016 – present)

The Kigali Amendment to phase-down use and production of HFCs was agreed in October 2016. In decisions XXVIII/2 and XXVIII/3 accompanying that agreement, Parties agreed on ways to enhance energy efficiency given that many HFCs are refrigerant gases used in space cooling and refrigeration applications. Under this, Parties requested the ExCom to develop cost guidance supporting the integration of energy efficiency with low-or zero-GWP technologies and TEAP to provide supporting literature on various aspects of energy efficiency.<sup>20,21</sup> Energy efficiency has thus become an essential part of the Montreal Protocol, although it is still not a binding requirement in the HFC phase-down plans of countries.

In this section we highlight some of the key discussions on energy efficiency at the MOP and ExCom. While important developments at the MOP have been summarised here, information drawn from ExCom meeting reports form the basis of this analysis.

### 77th ExCom (Nov-Dec 2016)

The 77th meeting of the ExCom, held in November-December 2016 shortly after the 28th MOP (Kigali Amendment), a discussion on voluntary contributions recognized energy efficiency as a priority area.<sup>22</sup> At the 29th MOP held in 2017, Decision XXIX/10 extended the requirement for TEAP’s evaluation of energy efficiency, to include an overview of activities of other major climate funders and financiers working in the area of energy efficiency.<sup>23</sup> Thus, financing energy efficiency was a subject identified within a year of the Kigali Amendment.

### 78th, 79th and 80th ExCom (April, July, and November 2017)

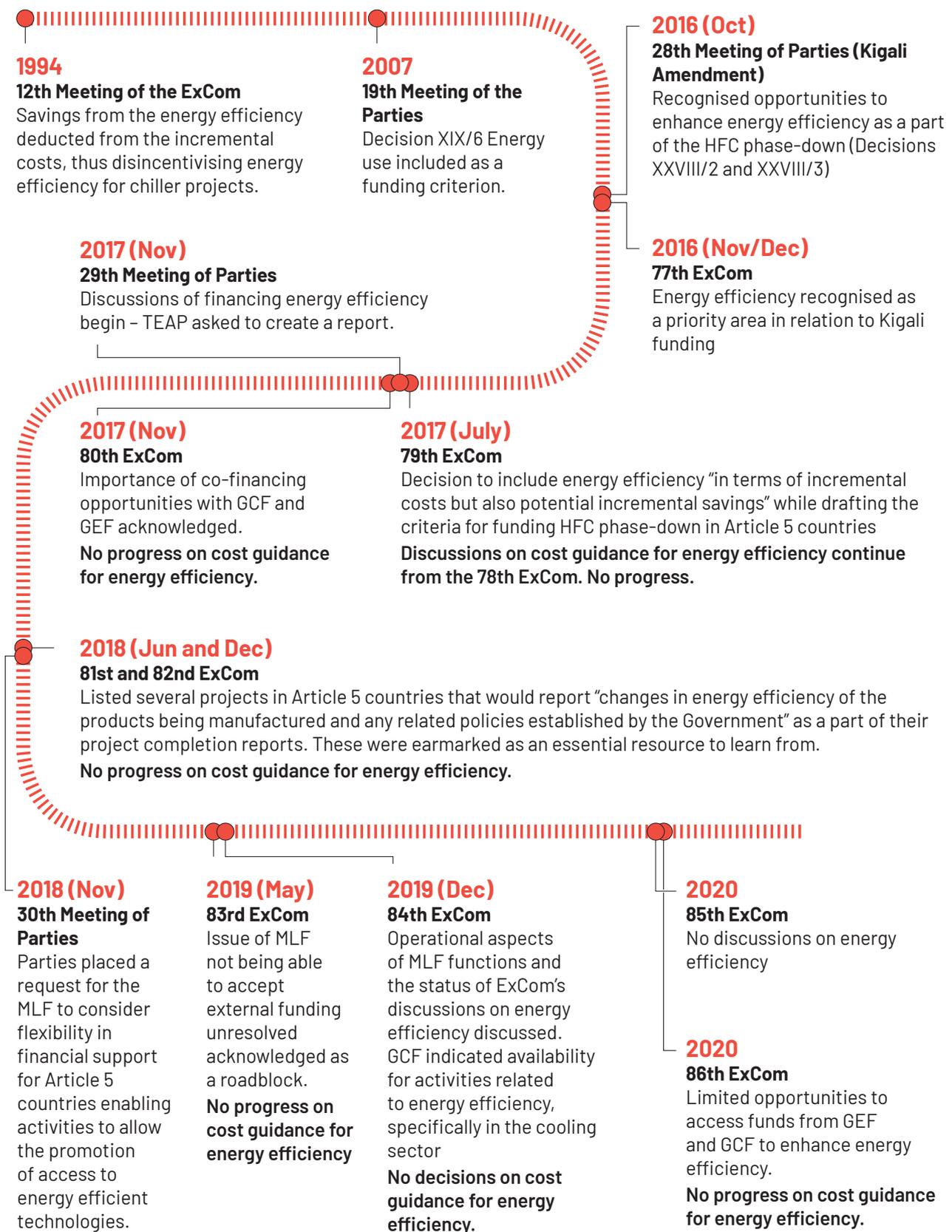
The 78th ExCom meeting in April 2017 had an elaborate discussion on the issue of energy efficiency. A lot of these discussions point to a diversity of subjects under and viewpoints on energy efficiency. Some of the highlights from this meeting were:<sup>24</sup>

- On a matter related to survey reports submitted by countries on ODS alternatives, it was noted that while there were provisions to report energy efficiency on a voluntary basis, no such information was received so far.
- While discussing incremental operational costs (IOC), it was determined that energy efficiency had not been directly considered in previous calculations of IOC and needed to be discussed by the ExCom.
- The ExCom noted that industrial development in the refrigeration and air-conditioning sector was strongly affected by decisions taken under the Montreal Protocol, and that it was therefore important to incorporate energy efficiency considerations into the policies and guidelines of the Protocol.
- Finally, the meeting examined how energy efficiency could be funded with suggestions being – direct financing of energy efficiency improvements, energy efficiency in production and consumption, payback period and eligible incremental cost.

A pertinent highlight of the 79th ExCom held in July 2017 was the decision to include energy efficiency “in terms of incremental costs but also potential incremental savings” while drafting the criteria for funding HFC phase-down in Article 5 countries (Decision 78/3). There was also reference made to drawing lessons from chiller projects financed under HPMP to understand financing and estimating benefits if energy efficiency – to be discussed in the 80th ExCom.

Meetings beginning from the 80th ExCom were based on inputs received from the TEAP on energy efficiency and discussed financing opportunities from climate funds. At the 80th ExCom in November 2017, the importance of co-financing opportunities with Green Climate Fund (GCF) and Global Environment Facility (GEF) was acknowledged

**Figure 1: Major decisions and progress on energy efficiency from ExCom and MOP meetings**



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as important. To this end, chiller projects were referred to as a valuable information source on co-financing arrangements aimed at enhancing energy efficiency in refrigerant phaseout projects. They further noted the importance of keeping co-financing opportunities as simple as possible and not integrating too many entities with different priorities.

No decisions were made in relation to including energy efficiency under the cost guidelines for HFC phase-down.

### **81st and 82nd ExCom (June and December 2018)**

The 81st<sup>25</sup> and 82nd<sup>26</sup> meetings held in June and December 2018 respectively, listed several project proposals in Article 5 countries that would report “changes in energy efficiency of the products being manufactured and any related policies established by the Government” as a part of their project completion reports. These were earmarked as an essential resource to learn from.

Drawing from decision at the 82nd ExCom, the 30th MOP in November 2018 under Decision XXX/5<sup>27</sup> requested the MLF to “consider flexibility within the financial support provided” to allow Article 5 Parties “who wish to do so” to use part of the support approved for enabling activities under the Kigali Amendment implementation for energy efficiency policy and training support as it relates to the phase-down of controlled substances, such as:

- Developing and enforcing policies and regulations to avoid the market penetration of energy-inefficient refrigeration, air-conditioning and heat-pump equipment.
- Promoting access to energy-efficient technologies in those sectors.
- Targeted training on certification, safety and standards, awareness-raising and capacity-building aimed at maintaining and enhancing energy efficiency.

This decision also addressed the growing issue of additional finance required for a low-GWP high-efficiency transition, by:

- Requesting the MLF to consider increasing the overall amount of funding provided to Article 5 countries to support the three initiatives listed above.
- Requesting the ExCom and the Ozone Secretariat to liaise with other funds and financial institutions to explore mobilizing additional resources and set up modalities for cooperation, such as co-funding arrangements, to maintain or enhance energy efficiency when phasing down HFCs.

### **83rd and 84th ExCom (May and December 2019)**

The 83rd ExCom in May 2019 discussed energy efficiency in the context of three papers:<sup>33</sup>

- Paper on ways to operationalize paragraph 16 of decision XXVIII/2 and paragraph 2 of decision XXX/5 of the Parties (decision 82/83(c)).
- Paper on information on relevant funds and financial institutions mobilizing resources for energy efficiency that may be utilized when phasing down HFCs (decision 82/83(d)).
- Summary of the report by the Technology and Economic Assessment Panel on matters related to energy efficiency with regard to the issues identified in decision 82/83(e) (decision 82/83(f)).

The first paper focuses on energy efficiency and servicing sector and thus is not the focus of our paper. Discussions on the second paper alluded to tapping into external funds for financing energy efficiency while the MLF focused on incremental costs for HFC phase-down. However, Members remarked that this was hindered by the issue of MLF not being able to accept external funding still; in turn restricting the possibility of using any external funding mechanism for energy efficiency. Challenges related to engaging with external funds were further discussed in terms of funding cycles, mechanisms, and priorities, however, no concrete decisions or solutions were arrived upon. Discussions on the third paper listed above was deferred to the 84th ExCom.

In the 84th session of the ExCom reported that there were several meetings between the Secretariat and the GCF.<sup>28</sup> These meetings centred around operational aspects such as how MLF functions and the status of ExCom’s discussions on energy. The report indicated the following response from GCF: “The representative of the GCF had indicated that funding could be available under its replenishment to fund activities related to energy efficiency, specifically in the cooling sector.”<sup>29</sup>

No decisions related to energy efficiency or its funding were made at the 84th ExCom. Notes from the 84th ExCom session indicated continuation of information gathering to supplement decisions on energy efficiency.

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## 85th and 86th ExCom (2020/2021)

There were no discussions on energy efficiency at the 85th Meeting.

The 86th ExCom continued discussions on GCF and GEF as possible external funding entities. However, it was noted in the 86th ExCom Meeting that there were limited opportunities to access funds from GEF and GCF to enhance energy efficiency as “GEF funds for climate change mitigation were currently disbursed through its system for transparent allocation of resources, which required funding requests to be part of project proposals submitted by developing countries within a climate change mitigation portfolio, direct collaboration with GEF for accessing funds was complicated.” On GCF the Secretariate remarked that, “GCF, meanwhile, had not earmarked funds for activities to enhance energy efficiency in cooling applications and accepted proposals only from accredited entities or bodies working with them.”<sup>30</sup>

Thus, there is a gridlock on decisions related to funding energy efficiency under the HFC phase-down as there are:

- No cost guidelines to fund energy efficiency under HFC phase-down.
- No modalities to channel funds towards energy efficiency.
- Limited opportunities to access funds from GEF and GCF.

## 2.2. Insights from TEAP reports and state of knowledge on Energy Efficiency

As mentioned before, TEAP has continually provided critical information on energy efficiency beginning from the 80th ExCom Meeting held in November 2017. TEAP has submitted four reports on energy efficiency:

1. Decision XXVIII/3 Working Group Report on Energy Efficiency (re-issued on 23 October 2017 for technical reasons)
2. Decision XXIX/10 Task Force Report on issues related to energy efficiency while phasing down hydrofluorocarbons (Vol. 5) (in May and September 2018)
3. Decision XXX/5 Task Force Report on Cost and availability of Low-GWP Technologies/ Equipment that maintain/enhance energy efficiency (in May and September 2019)
4. Decision XXXI/7 Continued provision of information on energy-efficient and low-global warming-potential technologies (September 2020 and 2021)

The 2017 TEAP report was a scoping study that looked at trends in RACHP, technology availability, policy needs and opportunities to finance energy efficiency. Later TEAP reports used this as the starting point and detailed out each of the sections. In this section we thus highlight key information from TEAP reports under three critical elements of energy efficiency – finance, policy, and technology.

### 2.2.1. Financing Energy Efficiency

The 2018 TEAP report focused on funding institutions relevant to energy efficiency. The report identified different sources of funding for energy efficiency that included Multilateral Climate Funds, Multilateral Development Banks (MDB), Bilateral funds and Private finance as listed in Box 1. Among these, MDBs and Private Finance make a much larger contribution to climate finance than multilateral funds. However, multilateral funding act like a buffer to reduce risks for others investing in clean technology projects.<sup>31</sup> MLF, GEF and the GCF are the three global institutions that have been established to address global environmental issues.

## Box 1: Types of financial institutions highlighted in TEAP 2018 report

The TEAP task force report<sup>32</sup> on energy efficiency provides a comprehensive assessment of funding opportunities for energy efficiency. The available funding and the institutions can be classified under the following broad categories:

**Funding institutions: Funding institutions provide direct monetary support to a project based on defined criteria and application process. These include:**

- i. MLF
- ii. Kigali-Cooling Efficiency Program (K-CEP)
- iii. GEF

**Financing institutions: These provide loans for projects under typical application requirements and terms.<sup>33</sup> These include:**

- i. GCF
- ii. Climate Investment Fund (CIF)
- iii. World Bank Group (WBG)
- iv. Regional Development Banks, including the African Development Bank (AfDB); the Asian Development Bank (ADB); the European Bank for Reconstruction and Development (EBRD); and the Inter-American Development Bank (IDB)
- v. European Investment Bank (EIB)
- vi. Other European EE funding programmes, including the Global Energy Efficiency and Renewable Energy Fund (GEEREF); and Horizon 2020

**Bilateral Programmes:**

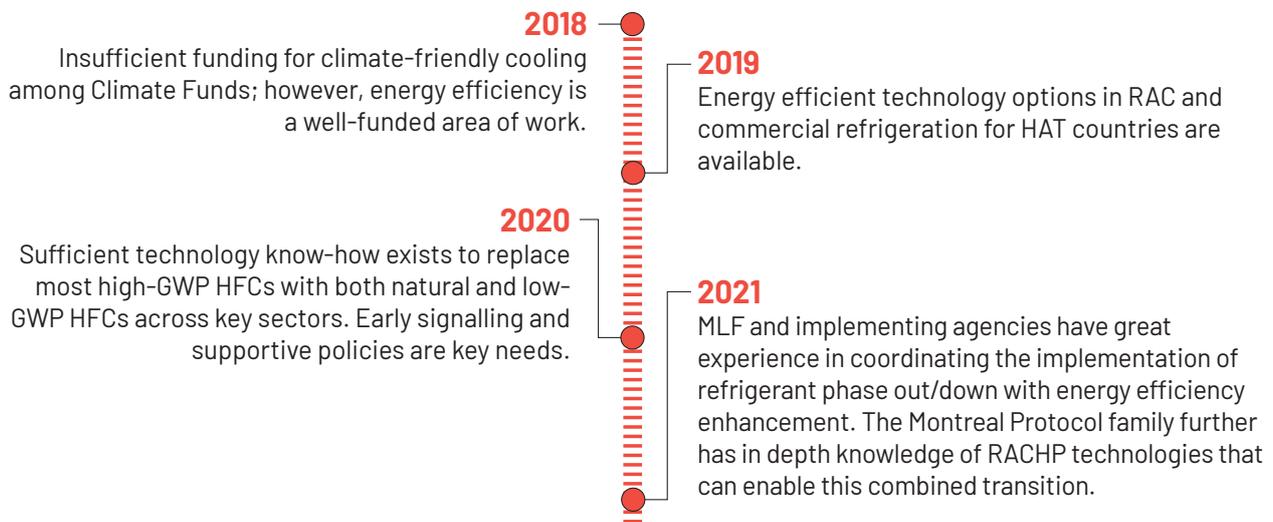
- i. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- ii. US Agency for International Development (USAID)
- iii. Canadian International Development Agency (CIDA)

A key insight from this report was that very little funding is generally available for projects on climate-friendly cooling from climate funds; majority of funding go to energy access, renewable energy transmission and other related investment projects.<sup>34</sup> To this end, the report noted that less than 0.1 percent of ODA<sup>35</sup> projects in 2014 and 2015 focused on cooling, thereby indicating low international focus on cooling relative to other development topics.<sup>36</sup>

In addition, other insights were:<sup>37</sup>

- The global investment in energy efficiency is dominated by buildings.
- Despite the low level of funding focusing on RACHP sectors, there are numerous financial resources for project implementation in the field of energy efficiency. Besides funding institutions that provide resources in the form of directed grants, there are financing institutions that provide project funding through mechanisms such as loans, green bonds, or other instruments. Moreover, private capital is an additional source for companies that might be interested in financing project implementation against investment payback.
- Opportunities for partnerships with shared goals among different sources of funds, and options for co-financing would be important to planning for potential projects related to energy efficiency in the RACHP sector while phasing down HFCs.
- To strengthen financing of the potential projects that meet Montreal Protocol targets and energy efficiency objectives in the phase-down of HFCs, there is a need to address the barriers (within the MLF) against coordination with existing financial organizations.

**Figure 2: Key insights from the TEAP reports on Energy Efficiency**



MLF project funds are predominantly allocated based on performance. This performance is judged based on:

- Detailed assessment of incremental costs in line with ExCom decisions.
- Specific project outputs, and project implementation procedures including reporting conditions.
- Compliance targets for phasing out controlled substances.
- Penalty in case the specified consumption targets in the agreements are exceeded.<sup>38</sup>

These elements are a part of the multi-year agreements (e.g., HCFC phase out management plans) with countries. Projects, thus funded, often also include components with external sources of funding (e.g., equity funding from respective enterprises, debt funds, grants from other institutions) where additional resources are needed for implementation. However, co-financing or blended financing, for an energy efficient HFC phase-down, may not be as straight-forward. To this end, the World Bank noted that despite the existence of several sources of financing that address energy efficiency in developing countries that could be leveraged to finance a combined leap-frog transition to the most efficient, climate-friendly cooling technologies, challenges arise with respect to timing, approach, and implementation.<sup>39</sup>

In terms of timing, there are currently no funds that provide predictable funding for countries to secure funds with reference to their compliance obligations to the Montreal Protocol. While implementing projects to meet Montreal Protocol compliance targets and energy efficiency objectives in the phase-down of HFCs, funding from different sources would have to be synchronized in terms of fund flow and implementation needs, for timely achievement of these objectives at the project and programme level. However, this may not be as easy when multiple parties are involved.

In terms of approach, climate financing traditionally takes a demand-side approach wherein end-users are incentivised to reduce their energy use, while the Montreal Protocol works with equipment manufacturers to replace ODS in production processes. While there are large funds available for demand-side approach, including development of policies and regulations to avoid the market penetration of energy-inefficient equipment's, development of MEPS, training, and capacity building etc., there are no global funding source to fund manufacturers to produce energy efficient appliance. MLF is the only source that has the experience and modalities to fund manufacturers to fund EE while phasing down HCFCs and HFCs. Multisource financing adds to transaction costs and elevate governance and decision risks in interdependent financing operations.<sup>40</sup>

In terms of the modalities of financing, institutions have their own specific funding/ financing windows and specific criteria under these windows. Further, these funds are allocated and approved for implementation based on assessments and objectives that vary substantially from one institution to another. Moreover, the procedures followed by institutions can vary depending on the type of instrument and window used. For example, if the mode of financing is a loan, then the project funding cycle would be different from grant funds provided for the project. Fundamentally, depending on the strategic priorities and funding modalities of the institution financing energy efficiency can vary substantially among institutions.

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## 2.2.2. Technology availability and policy needs

The later reports of TEAP discussed technology availability and policy needs. In the September 2019 report, TEAP evaluated the Residential Air-Conditioning as well as Commercial Refrigeration landscape, including technological viability in different climatic conditions classified as low, medium, and high ambient temperature (HAT) regions. A key takeaway was that “established commercial refrigeration technology is suitable for all ambient conditions and efficient air conditioning technology is also available in HAT countries.”<sup>41</sup> The September 2020 report further added that technology and refrigerants are widely available to replace most high-GWP HFCs, with both natural and lower GWP fluorinated refrigerants options covering key market sectors. This is supported by the numerous best practice case studies presented in the TEAP reports.<sup>42</sup>

While offering some initial cost estimates, this report<sup>43</sup> emphasised – “influence of market mechanisms and national policies play a large role on the availability and costs of equipment and components and is considered as the main levers for the simultaneous energy efficiency and refrigerant transition”. The report further observed that “retail price of products is not an adequate indicator for the costs of maintaining or enhancing energy efficiency in new equipment due to bundling of various non-energy related features with higher efficiency equipment. In general, energy efficiency costs are lower than the total retail costs.”

This was followed by the TEAP report of September 2020, which reiterated that “technology and refrigerants are now widely available to replace most high GWP HFCs, with both natural and lower GWP fluorinated refrigerants options covering key sectors.”<sup>44</sup> However, it also noted that despite technological availability, accessibility to these technologies is low in many Article 5 (and even in some non-Article 5) parties. To counter this, the report recommended:

- Faster ratification of the Kigali Amendment,
- Progress in operationalising the Kigali Amendment,
- Enabling individual Parties for fast action,
- Supporting policies designed to improve accessibility, e.g., tackling market barriers affecting the end consumer,
- Adopting ambitious and progressive energy performance standards across regions that are appropriately harmonized and coordinated with HFC phase-down strategies (e.g., U4E model regulations),
- Coordinating multi-agency funding for Article 5 enterprise conversions for both high energy efficiency and lower GWP refrigerants.

In addition to Kigali ratification, key national policies identified were MEPS, regarding which the report noted that “a lot of the equipment is widely available, [countries] do not need to create new product evaluations, bottom-up engineering analyses and life cycle cost modelling.” Timely coordinated MEPS implementation across countries could avoid the dumping of inefficient products that cannot be sold elsewhere because of the MEPS in force in other countries.<sup>45</sup>

The report further recognised the need for cooperation between senior energy efficiency officials and ozone officers to expedite the “further transition to lower GWP and higher energy efficient equipment by the coordinated adoption of refrigerant policies with broad energy efficiency policies including the revision of MEPS and labels. In contrast, the implementation of ambitious MEPS alone can undermine the HFC phase-down by encouraging improved energy efficiency of cooling equipment, but with the use of high GWP refrigerants, especially in countries that are primarily equipment receivers.”

Integrated modelling of the direct (refrigerant-related) GHG emissions and indirect (energy-related) GHG emissions from RACHP markets provides valuable insights into the importance of linking improvements in energy efficiency with the HFC phase-down. Several modelling tools are available and in development.

Early outputs from the “HFC + Energy Outlook Model” suggest:

- Indirect energy related GHG emissions represent around 70% of total GHG emissions from the RACHP sector.
- There are substantial benefits from earlier action to prevent the increase in high GWP HFC use in reducing the total cumulative emissions.
- Combining faster phase-down of high GWP HFCs and improving efficiency provides substantial additional benefits in reducing the total cumulative emissions.
- There is a large potential to reduce both direct (>90%) and indirect emissions (>98%) by 2050, compared to a business-as-usual scenario.

- How to identify the measures that yield the greatest benefits through addressing both the refrigerant-related and the energy-related GHG emissions.
- Transitioning to the use of heat pumps is important in terms of the abatement of fossil fuel emissions from heating.

Some of the key insights from TEAP reports are summarised in Figure 2. In addition to these, the TEAP has thus clearly conveyed to the ExCom that:

- MLF and implementing agencies have enough experience to deal with refrigerant phase-down and energy efficiency together. “Montreal Protocol family” can strongly enable this combined reduction of direct and indirect GHG emissions.
- Integrated models of the direct (refrigerant-related) GHG emissions and indirect (energy-related) GHG emissions from RACHP is available and can be suitably tailored for different regions.
- Energy efficiency can be affordable and is currently available in countries. In absence of suitable interventions countries run the risk of adopting inefficient cooling appliance or high efficiency and but with high-GWP refrigerants. Thus, while access to high energy efficient/ lower GWP products is improving, it remains limited in many Article 5 parties and even in some non-Article 5 parties.
- Kigali Ratification, supportive policies, multi-agency coordination and adoption of progressive energy performance standards across regions can help with improved availability and accessibility to high energy efficiency/lower GWP products in Article 5 parties.

Thus, it remains that while the MLF cannot accept any external funding current discussions centre around tapping into climate funds to finance energy efficiency leading to no definitive outcome. Simultaneously, the TEAP has repeatedly reported on the availability and readiness of low-GWP, high efficiency cooling technology and the significance of supportive policies and market preparedness factors to make them available and accessible. These supportive activities are not likely to come about without a clear direction from the MLF on funding the HFC phase-down including decisions on energy efficiency. It has also been noted that the MLF has the capacity to support such a joint transition. Past projects funded by the MLF have considered energy efficiency, albeit in HCFC phaseout scenarios.

A critical element of the current gridlock is the lack of cost guidelines and cost factor for energy efficiency for the MLF. Motivation to fund energy efficiency may be a great starting point to finalise these cost guidelines. A critical element contributing to this motivation among Parties maybe the answer to the question – Is energy efficiency affordable?

### 3. Energy efficient cooling – A case study on India

**Residential air**-conditioner ownership in India has risen from two million in 2006 to fourteen million units in 2016. It is forecasted to reach 200 million by 2030.<sup>46</sup> The production of room air conditioners (RAC) has been growing at 13% per year since 2010 and is expected to continue to grow by 11 to 15% per year over the next 10 years.<sup>47</sup> Below are some critical insights on the state of energy efficiency for RACs in India.

In terms of energy efficiency for appliances, India has a robust MEPS program that is monitored, evaluated, updated, and revised on a regular schedule. The Bureau of Energy Efficiency (BEE) requires mandatory labelling for room ACs from 1 to 5 stars and has progressively revised MEPS biannually.

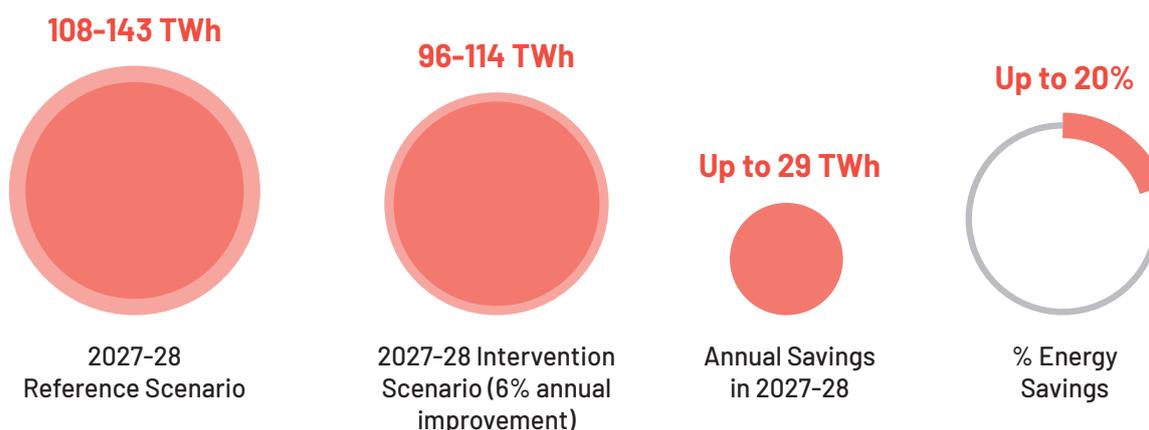
The MEPS of a 3-star split RAC in India has increased from 2.7 watt/watt in 2009 to 3.5 watt/watt in 2018 – an improvement of 2.6% annually. The MEPS of 5-star split RAC has improved at a rate of 3.8% annually between 2009 and 2018 – from 3.1 watt/watt to 4.5 watt/watt.<sup>48</sup> The weighted average MEPS of split RACs have historically (2009–2019) improved at an annualized rate of about 3%.<sup>49</sup>

Over 90% of all RACs sold are branded. A 3-star rated AC is the most popular choice followed by the most efficient five-star, with an average price differential of 20% between the two models.<sup>50</sup> India was the first country to prepare a national cooling action plan. The India Cooling Action Plan (ICAP), released in March 2019, aims to:<sup>51</sup>

- Reduce cooling demand across sectors by 20% to 25% by 2037-38.
- Reduce refrigerant demand by 25% to 30% by 2037-38.
- Reduce cooling energy requirements by 25% to 40% by 2037-38.

The potential to reduce the global warming impact of the rapidly growing RACHP sector in India is significant. According to ICAP, if the weighted average MEPS of room AC sector improves at 6% annually, compared to 3% in the past, then up to 20% of electricity can be saved (see Figure 3).<sup>52</sup>

**Figure 3: RAC annual energy demand in a 10-year timeframe**



Source: India Cooling Action Plan (2019)

According to the estimates by LBNL, the benefits of improving energy efficiency is even higher than those projected by the ICAP. If, starting 2018, the market average room AC efficiency improves by 6% per year instead of the current 3% per year, about 39 GW of peak load (equivalent to about 80 power plants of 500 MegaWatt (MW) each), and more than 64 TerraWatt-hour (TWh) per year of energy (equivalent to the current electricity consumption of the entire state of Gujarat) could be saved by 2030.<sup>53</sup> The net present value (NPV) of the consumer benefit between 2018 and 2030 would range from US\$600 million (if room AC prices increase as expected based on estimates of current cost of efficiency improvement) to US\$25 billion (if room AC prices do not increase with efficiency improvement, as has been the case historically).<sup>54</sup>

The GHG emission abatement potential is even greater if energy efficiency improvements and HFC phase-down are undertaken simultaneously. If, starting in 2030, all stationary air conditioning and refrigeration equipment were replaced with the highest-efficiency and climate-friendly refrigerant technologies available in 2018, then India can avoid GHG emissions of 0.4 GT/year in 2030.<sup>55</sup> This is more GHG abatement than installing 100 GigaWatt (GW) of solar PV plants. Three-quarters of the avoided emissions are due to energy efficiency and the remaining quarter is from the transition to low-GWP refrigerants.<sup>56</sup>

The good news is that these efficiency gains and GHG emission abatement can be achieved at a reasonable incremental cost. The difference in the retail price of a 1.5 tonne 3-star split RAC with an average Indian Seasonal Energy Efficiency Ratio (ISEER) of 3.8 and a 1.5 tonne 5-star split RAC with average ISEER of 5 is about 22% (about US\$ 150). The retail price difference for a 2 tonne RAC is also in the same range.<sup>57</sup> However, retail price of products is not an adequate indicator for the costs of maintaining or enhancing energy efficiency in new equipment due to bundling of various non-energy related features with higher efficiency equipment.<sup>58</sup> Furthermore, the incremental cost of efficiency improvement is much lower than the retail price due to mark-ups of 140-240% to cover wholesale and retail costs, profit margins, and taxes.<sup>59</sup> If we assume the mark-ups to be a lower 100% (a gross underestimation), then the incremental cost of improving energy efficiency from ISEER 3.8 to 5.0 in India is about US\$75. This is 12.5% of the average retail price of a 1.5 tonne 5-star split RAC.<sup>60</sup>

However, manufacturers have opposed the recent proposal of the BEE to increase the MEPS of RAC. They have pointed-out the increase in cost of components and increases in taxes and import duties on major components, to justify their position.<sup>61</sup> A support programme to cover the incremental cost will enable them to make the change-over.

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## 4. Discussion and way forward

**This working** paper is an attempt to track the progress on energy efficiency under the Kigali Amendment and propose a way to operationalise it. It is evident that, the discussions at the MLF are skirting the main point – the MLF has the experience to fund energy efficiency.

While technology exists, market preparedness and uptake of high efficiency, low-GWP technologies is possible through better policy and focused financing. While the Parties are exploring the possibilities around tapping into external funds for financing energy efficiency, little progress has been made. Further, the discussions around co-financing from other multilateral sources are ignoring the facts that:

- Climate funds focus on demand-side energy efficiency improvements. MLF is the only fund that provides incremental costs to manufacturers to improve energy efficiency from supply-side.
- Each funding institution has a different methodology, reporting period, funding cycle, reporting and compliance requirements, co-funding requirements etc. These will not match the requirements of MLF and the Montreal Protocol schedule.
- Experience of merging funds has not been successful. The transactional costs and risks are very high.
- National Ozone Units are not the decision-makers on energy efficiency policies and regulations. They have expertise in supporting the implementation of supply-side projects and not demand-side needs.
- Existing funds are addressing the issues of enhancing MEPS, developing policies to remove inefficient appliances and capacity building. MLF will duplicate the efforts by entering these areas.

In a nutshell, existing approach to integrating energy efficiency may not help Article 5 countries realise an accelerated transition to climate-friendly cooling. The current narratives on tapping into existing funds for energy efficiency has already proven to lead to a dead-end, primarily due to MLF's inability to integrate this into its existing structure. In addition to this, aforementioned issues with co-financing and blended financing limit the potential for countries to drive an accelerated transition to energy efficient, low-GWP transition. Historically, the MLF has proven flexibility in integrating climate needs in an exclusively chemical focused protocol. We thus propose that existing mechanisms within the MLF should be leveraged to realise the goals of the Kigali Amendment.

### **Energy Efficiency Incentive – A framework to fund Energy Efficiency under the MLF**

MLF has in the past given incentives to fast-track phase-down of high-GWP refrigerants. The Climate Incentive (CI) was a mechanism, through which up to a maximum of 25% above the cost-effectiveness threshold was provided as funding for projects for the introduction of low-GWP refrigerants.<sup>62</sup> MLF also introduced a tool, the Multilateral Fund Climate Impact Indicator (MCII), to assess the effect on the climate associated with the conversion of enterprises manufacturing air-conditioning, commercial cooling and commercial freezing equipment, from HCFC-22 (baseline) to alternative refrigerants.<sup>63</sup> It takes into account the emissions of refrigerants during manufacturing, operation and at the end of life, and the emissions of greenhouse gases occurring as a result of energy consumption<sup>64</sup> of refrigeration and air-conditioning equipment based on HCFC-22 (baseline) and alternative refrigerants.<sup>65</sup> The tool calculates CO<sub>2</sub>e emissions over the lifetime of the AC or refrigerator, summing both the direct and indirect emissions. This is then multiplied by the number of units produced per year. This is the climate impact of the annual production for a given technology over the lifetime of the equipment produced.

The objective of MCII is to offer an indication of the climate impact prior to the conversion project. The ExCom noted that: “The experience gained in applying the MCII had shown that the potential climate impact of the conversion of refrigeration and air-conditioning equipment from the baseline (HCFC-22) to alternative refrigerants can be measured objectively and systematically and enables the Executive Committee to monitor and account for the potential climate impact of the projects supported by the Multilateral Fund”.<sup>66</sup> This tool, therefore, can be easily repurposed to take into consideration HFC phase-down and energy efficiency improvements together.

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The MLF has all the tools to operationalize energy efficiency improvements alongside the HFCs phase-down, namely:

- Experience of implementing CI.
- An effective tool to measure indirect and direct climate impacts.
- Experience of funding energy efficiency while phasing down HCFCs.

The above three can be repurposed to develop an Energy Efficiency Incentives (EEI) to maximize the climate benefits of the Kigali Amendment.

We thus recommend that the ExCom changes its strategy and focuses on the following:

1. Develop EEI to support the energy efficient enhancement along with HCFC and HFC phase-down. The EEI could be a certain percentage (say maximum 25%) above the cost-effectiveness threshold.
2. The EEI should be provided for a global MEPS. Projects meeting and exceeding this MEPS should be eligible for EEI. For example, the global MEPS in 2030 could be at least EER of best available technology today.
3. The EEI should be applicable for fast phase-down of HFCs than those agreed in the Kigali amendment.

In conclusion, Ockham's razor or the principle of parsimony is the problem-solving principle which states that "entities should not be multiplied without necessity". In other words, when presented with competing hypotheses about the same prediction, one should select the solution with the fewest assumptions.

Currently, the ExCom of the MLF is trying a complex route with large number of assumptions. We recommend that it chooses a simple and tested formulation, with fewest assumptions, to operationalize energy efficiency. ■

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