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# Co-benefit Agenda of the Kigali Amendment

## A proposed framework to incentivise energy efficiency while transitioning away from high-GWP HFCs

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### INTRODUCTION

**THE INTERGOVERNMENTAL** Panel on Climate Change's (IPCC) recently released Special Report on impacts of global warming has come out with a dire prognosis: the world must limit warming to 1.5°C to avoid catastrophic impacts of climate change. But limiting warming to 1.5°C would require rapid and deep reductions in emissions in all sectors. A case in point is the building sector, which is responsible for one-third of global energy consumption, and must reduce emissions by 80-90 per cent by 2050.<sup>1</sup>



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<sup>1</sup> Summary for Policymakers, Special report on the impacts of global warming of 1.5°C, IPCC, 2018

## Rapid and deep reductions in GHG emissions from the cooling sector will be required to limit warming to 1.5°C.

How will that happen? Decarbonisation of energy systems and reduction in energy demand will have to go hand in hand. This will require a marked shift in investment patterns -- investments in low-carbon energy technologies and energy efficiency will have to approximately double in the next 20 years. The cooling sector will have a major role to play in reducing emissions from buildings, as about one-fifth of all the electricity used in buildings is for cooling.<sup>2</sup>

Global sales of air conditioners (ACs) have quadrupled since 1990 to reach 135 million units per year. There are now about 1.6 billion units in use currently, with over half of them in just two countries – China and the US. These ACs consume over 2,000 terawatt hours (TWh) of electricity every year, which is two and a half times the total electricity use of Africa!<sup>3</sup>

As per International Energy Agency (IEA) projections, the global stock for air conditioners (residential and commercial) will grow from 1.6 billion today to 5.6 billion by 2050. More than half of the growth in residential AC ownership will happen in China, India and Indonesia; there would also be significant growth in Africa and the Middle East. Due to this, global energy use for space cooling is expected to reach 6,200 TWh by 2050. The growth in cooling electricity demand between now and 2050 would be equivalent to the entire electricity demand as exists today in the US and Germany together.<sup>4</sup>

Given this scenario, what is it that can be done? Energy efficiency of ACs varies widely -- in all the major markets today, typically, people are buying air conditioners with average efficiencies less than half of what is available. Through more stringent minimum energy performance standards (MEPS) and other measures such as labelling, it can be ensured that the average energy efficiency of the stock of ACs worldwide becomes more than double between now and 2050. This can reduce energy demand from the cooling sector by half. Coupled with decarbonisation of power generation, CO<sub>2</sub> emissions from ACs can be reduced to just 150 million tonne by 2050, compared to 1,130 million tonne today – a whopping reduction of 87 per cent. Half of the savings, equivalent to 500 million tonne per year – will come directly from the improved efficiency of ACs. This would be in line with the CO<sub>2</sub> reduction trajectories to meet the 1.5°C target.<sup>5</sup>

<sup>2</sup> The Future of Cooling: Opportunities for energy efficient air conditioning, OECD/IEA, 2018

<sup>3</sup> ibid

<sup>4</sup> ibid

<sup>5</sup> ibid

Over 80 per cent of the global warming impact of refrigeration and air conditioning systems is associated with indirect emissions generated during the production of the electricity used to operate the equipment. The Kigali Amendment to the Montreal Protocol provides a great opportunity to reduce both direct and indirect emissions from the cooling sector. If the Parties to the Protocol are able to strike a deal that enables rapid introduction of highly energy-efficient appliances alongside a phase-down of high Global Warming Potential (GWP) HFCs, the total reduction of greenhouse gas emissions could be more than doubled.<sup>6</sup>

But what kind of a deal would allow this co-benefit agenda to happen?

## ENERGY EFFICIENCY AND THE MONTREAL PROTOCOL

The Montreal Protocol has had an ambivalent attitude towards energy efficiency.

In the Protocol's directions on phasing out of CFCs, there were clauses prohibiting the funding of any technology upgrades, including improvement in energy efficiency. In fact, the multilateral fund (MLF) deducted any costs towards energy efficiency improvement, as it was considered to be a technology upgrade. Take, for example, the decision of the Executive Committee (ExCom) at its 12th Meeting on chiller project proposals. The ExCom decided that consideration be given to the Total Equivalent Warming Impact (TEWI) in selecting an alternative technology in the chiller sector. This would include both direct effects (refrigerant global warming potential) and indirect effects (system energy efficiency), and impacts on human health and safety. But energy savings, said the ExCom, should be taken into consideration when calculating the incremental costs of replacement. 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 significantly.

The CO<sub>2</sub> emissions from the cooling sector can be reduced by 80-90% by 2050 from the current levels by doubling the energy efficiency and decarbonising power generation.

The attitude of the Protocol towards energy efficiency underwent a change with Decision XIX/6, which accelerated the phase-out of production and consumption of hydrochlorofluorocarbons (HCFCs). The key elements in Decision XIX/6 related to energy efficiency are:

- To encourage Parties to promote the selection of alternatives to HCFCs that minimise environmental impacts, in particular impacts on climate, as well as meeting other health, safety and economic considerations

<sup>6</sup> September 2018 TEAP Report, Volume 5: Decision XXIX/10 Task Force Report on issues related to energy efficiency while phasing down hydrofluorocarbons (updated final report)



- To agree that the ExCom, when developing and applying funding criteria for projects and programmes, and taking into account Paragraph 6, gives priority to cost-effective projects and programmes which focus on, inter alia:

- (a) Phasing-out first those HCFCs with higher ozone-depleting potential, taking into account national circumstances;

- (b) Substitutes and alternatives that minimise other impacts on the environment, including on the climate, taking into account global-warming potential, energy use and other relevant factors;

- (c) Small and medium-size enterprises

Following Decision XIX/6, the ExCom decided that all HCFC phase-out management plans (HPMPs) should capture the spirit of Decision XIX/6 and address the benefits for climate when looking at alternatives. Two concepts were introduced to operationalise Decision XIX/6:

- Climate incentive
- Multilateral Fund Climate Impact Indicator (MCII)

### **Climate incentive**

- At the 60th Meeting of the ExCom, it was decided that for Stage I of the HPMPs, funding of up to a maximum of 25 per cent above the cost-effectiveness threshold will be provided for projects when needed for the introduction of low-GWP alternatives.

- At its 74th meeting, the ExCom decided that for Stage II of the HPMPs, funding of up to a maximum of 25 per cent above the cost-effectiveness threshold would be provided for projects when needed for the introduction of low-GWP alternatives; however, for small and medium-sized enterprises (SMEs) in the foam sector with consumption of less than 20 metric tonne, the maximum would be up to 40 per cent above the cost-effectiveness threshold.

The 25 per cent climate incentive had mixed results. In many cases, it was not sufficient to prevent transitions to high-GWP HFCs.

### **Multilateral Fund Climate Impact Indicator (MCII)**

The MCII is a tool that provides an indication of 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. It takes into account the emissions of refrigerants during manufacturing, operation and at the end of life (direct emissions), and the emissions of greenhouse gases occurring as a

**The Montreal Protocol seriously started looking at the energy efficiency issues with with Decision XIX/6 which prompted introduction of the concepts of Climate incentive and Multilateral Fund Climate Impact Indicator**

result of energy consumption<sup>7</sup> of refrigeration and air-conditioning equipment based on HCFC-22 (baseline) and alternative refrigerants (indirect emissions).

“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>8</sup>

## THE KIGALI AMENDMENT

Decision XXVIII/2 deals with issues identified while phasing down HFCs. These include:

- Funding criteria
- High ambient temperature conditions
- Natural refrigerants
- Energy efficiency
- Linkages with the ongoing HCFC phase-out

The Decision requests the 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 hydrofluorocarbons, while taking note of the role of other institutions addressing energy efficiency, as appropriate.

The ExCom would be presenting its work on cost guidance associated with maintaining and/or enhancing energy efficiency to MOP30 in November 2018 in Quito, Ecuador, with the aim of receiving reactions and inputs.

**It is quite clear from above that the ExCom and the MLF have had an experience of dealing with energy efficiency issues during the CFC phase-out as well as during the HCFC phase-down. The question is, can these experiences be utilised for enhancing energy efficiency during HFC phase-down.**

The experience of using MCII to assess the climate benefits of conversion has largely been positive. It has enabled the ExCom and the MLF to monitor and account for the climate impacts of projects

<sup>7</sup> The MCII uses a theoretical model to estimate energy consumption. It contains an internal model that calculates the energy consumption of the system based on first principles for the thermodynamic circuit. It effectively calculates cycles based on average system characteristics, such as expected compressor efficiencies and heat exchanger performances. The performance of alternative refrigerants is then estimated based on first principles based on the thermodynamic differences with HCFC-22. The model assumes that the alternative refrigerants have no impact on compressor efficiency and heat exchanger performance, which in reality may not be the case as these components may be, or may need to be, optimized for the alternative selected.

<sup>8</sup> Report on the Multilateral Fund Climate Impact Indicator (Decision 69/23), Seventy-third Meeting of the Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol, November 2014

## A FRAMEWORK TO INCENTIVISE ENERGY EFFICIENCY WHEN PHASING DOWN HIGH-GWP HFCS

There are many learnings, within and outside the Montreal Protocol, on energy efficiency improvements in the cooling sector:

1. Energy efficiency has its own co-benefits in terms of reduction in energy demand, peak loads and pollution and health costs etc. These co-benefits get translated into economic benefits for the local and national economy.
2. Despite being a low-hanging fruit, there are barriers to enhancing energy efficiency in developing countries. These barriers could be financial, market-related, information-related, institutional, regulatory, technical or capacity-related in nature. Removing them would require resources to fill the gaps in private sector investments.
3. Labelling programmes and Minimum Energy Performance Standards (MEPS), driven nationally, is the key for improving energy efficiency. Although promoting energy-efficient products through voluntary or mandatory labelling is the most widely used and longest-running policy measure, MEPS have proved to be the single most effective policy measure for boosting efficiency. There is considerable scope for tightening MEPS, as the seasonal energy efficiency ratio (SEER) of available ACs is significantly more than the average energy efficiency of equipment sold in the market.<sup>9</sup>
4. There is a large amount of fund available from multilateral and bilateral sources to support energy efficiency, but it is not targeted at the cooling appliance sector.<sup>10</sup> Energy efficiency improvements in appliances have been largely driven through regulations and paid for by consumers.
5. The Montreal Protocol's efforts towards co-financing for additional resources to maximise the environmental (including climate) benefits during HPMPs have not materialised. In fact, many of the mechanisms for co-financing were found to be incompatible with the requirements of the MLF.

From the above, following inferences can be made:

- Considering the co-benefit, funding for energy efficiency improvement has to be viewed as an 'incentive' to overcome barriers.

**The framework to incentivise energy efficiency while phasing down HFCs must be built on the past experience of the Montreal Protocol on dealing with energy efficiency issues during the CFC phase-out as well as during the HCFC phase-down.**

<sup>9</sup> The Future of Cooling: Opportunities for energy efficient air conditioning, OECD/IEA, 2018

<sup>10</sup> September 2018 TEAP Report, Volume 5: Decision XXIX/10 Task Force Report on issues related to energy efficiency while phasing down hydrofluorocarbons (updated final report)

- The objective of the Energy Efficiency Incentive (EEI) should be to push for improvements in the MEPS.
- Instead of looking for funding from other sources, the Montreal Protocol should look at funding energy efficiency improvement from the MLF. MLF can raise money from other multilateral funds.

### The proposed framework

The framework for enhancing energy efficiency has to be built on the concepts of Climate Incentive and MCII.

- Like climate incentives during HPMPs, Parties should agree to the concept of Energy Efficiency Incentive (EEI).
- An additional funding of at least 25 per cent above the cost-effectiveness threshold should be earmarked for the EEI.
- EEI should be linked with regular improvements in MEPS.
- MCII tool should be remodeled to improve the energy efficiency aspect. The tool should then be used to assess proposal and approve EEI.
- Instead of asking parties to look for other sources of funding, MLF should be authorized to raise funds from other multilateral sources to fill the gap in funding energy efficiency improvements

Introduction of Energy Efficiency Incentive along with remodelled MCII should form the bedrock of the framework to enhance energy efficiency during HFC phase down

## CONCLUSION

The Kigali Amendment to the Montreal Protocol was adopted to reduce GHG emissions from the Refrigeration and Air Conditioning sector. As 80 per cent of these GHG emissions are due to the use of electricity, it is incumbent on the Protocol to address energy efficiency itself and not leave it to some other multilateral/ bilateral agency.

The Montreal Protocol and MLF have the necessary experience of handling energy efficiency issues. The framework for enhancing energy efficiency, therefore, should be built on this acquired experience. We propose that a concept of Energy Efficiency Incentive (EEI) should be introduced during HFC phase-down to incentivise enhancement of energy efficiency of appliances. Like the Climate Incentive, an additional funding of at least 25 per cent above the cost-effectiveness threshold should be earmarked for the EEI. For appraisal of energy efficiency benefits, the MCII tool should be suitably modified to estimate the energy-efficient improvements and the total reduction of GHG emissions during conversion.



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