

Summary of the Second Part of the 43rd Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol: 14-17 July 2021

In the wake of ongoing disruption caused by the COVID-19 pandemic, the second part of the 43rd Meeting of the Open-ended Working Group (OEWG 43) of the Parties to the Montreal Protocol convened online to tackle technical work on two issues that are crucial to efforts to repair and protect the ozone layer: the unexpected increase in emissions of trichlorofluoromethane (CFC-11) and developments related to energy-efficient and low-global-warming-potential (GWP) technologies. With two substantively identical sessions for each issue scheduled at different times to accommodate participants in a wide range of time zones, the Scientific Assessment Panel (SAP) and Technology and Economic Assessment Panel (TEAP) presented pre-recorded updates on their assessments of these subjects. Each presentation was followed by time for questions and answers and general statements, enabling participants to clarify their understanding of these technical issues.

On 14 and 15 July, delegates discussed the impact of the unexpected emissions of CFC-11, with many welcoming the SAP’s assessment that emissions are now declining, and the recovery of the ozone layer will not be significantly delayed. Several highlighted the need to strengthen monitoring and enforcement of parties’ obligations under the Montreal Protocol, with the aim of detecting unexpected emissions—and preventing illegal production and trade—of other ozone-depleting substances (ODS) in the future.

On 16 and 17 July, participants focused on new information related to energy efficiency and low-GWP technologies. The TEAP’s Energy Efficiency Task Force provided updates to its 2020 report, highlighting the growing accessibility of energy efficient technologies with low-GWP in the refrigeration, air conditioning, and heat pump sectors. The Task Force underscored the potential benefits of early action to improve energy efficiency both for ozone recovery and climate change, noting that synergies with energy efficiency during the phase-down of hydrofluorocarbons (HFCs) could double the climate benefits.

The discussions at OEWG 43 were strictly technical and aimed to establish a basis for the policy negotiations that are expected to take place at the combined meetings of the Conference of the Parties (COP) to the Vienna Convention and Meeting of the Parties (MOP) to the Montreal Protocol later this year.

Over 300 participants joined the meetings, including parties, observers, and experts representing the TEAP and SAP.

A Brief History of the Ozone Regime

Concerns that the Earth’s stratospheric ozone layer could be at risk from chlorofluorocarbons (CFCs) and other anthropogenic substances first arose in the early 1970s. At that time, scientists warned that releasing these substances into the atmosphere could deplete the ozone layer, hindering its ability to prevent harmful ultraviolet (UV) rays from reaching the Earth. This would adversely affect ocean ecosystems, agricultural productivity, and animal populations, and harm humans through higher rates of skin cancers, cataracts, and weakened immune systems. In response, a UN Environment Programme (UNEP) conference held in March 1977 adopted a World Plan of Action on the Ozone Layer and established a Coordinating Committee to guide future international action.

Key Turning Points

Vienna Convention: Negotiations on an international agreement to protect the ozone layer were launched in 1981 under the auspices of UNEP. In March 1985, the Vienna Convention for the Protection of the Ozone Layer was adopted. It called for cooperation on monitoring, research, and data exchange, but it did not impose obligations to reduce use of ODS. The Convention now has 198 parties, which represents universal ratification.

Montreal Protocol: In September 1987, efforts to negotiate binding obligations to reduce ODS usage led to the adoption of the Montreal Protocol, which entered into force in January 1989. The

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Montreal Protocol introduced control measures for some CFCs and halons for developed countries (non-Article 5 parties). Developing countries (Article 5 parties) were granted a grace period, allowing them to increase their ODS use before taking on commitments. The Protocol has been ratified by 198 parties.

Since 1987, several amendments and adjustments have been adopted, adding new obligations and additional ODS and adjusting existing control schedules. Amendments require ratification by a certain number of parties before they enter into force; adjustments enter into force automatically. All amendments except its newest, the Kigali Amendment, have been ratified by 197 parties.

London Amendment and Adjustments: At MOP 2, held in London, UK, in 1990, delegates tightened control schedules and added ten more CFCs to the list of ODS, as well as carbon tetrachloride (CTC) and methyl chloroform. MOP 2 also established the Multilateral Fund (MLF), which meets the incremental costs incurred by Article 5 parties in implementing the Protocol's control measures and funds clearinghouse functions. The Fund is replenished every three years.

Copenhagen Amendment and Adjustments: At MOP 4, held in Copenhagen, Denmark, in 1992, delegates tightened existing control schedules and added controls on methyl bromide, hydrobromofluorocarbons, and hydrochlorofluorocarbons (HCFCs). MOP 4 also agreed to enact non-compliance procedures. It established the Implementation Committee to examine possible non-compliance and make recommendations to the MOP aimed at securing full compliance.

Montreal Amendment and Adjustments: At MOP 9, held in Montreal, Canada, in 1997, delegates agreed to: a new licensing system for importing and exporting ODS, in addition to tightening existing control schedules and banning trade in methyl bromide with non-parties to the Copenhagen Amendment.

Beijing Amendment and Adjustments: At MOP 11, held in Beijing, China, in 1999, delegates agreed to controls on bromochloromethane, additional controls on HCFCs, and reporting on methyl bromide for quarantine and pre-shipment applications.

Kigali Amendment: At MOP 28, held in Kigali, Rwanda, in 2016, delegates agreed to amend the Protocol to include hydrofluorocarbons (HFCs) as part of its ambit and to set phasedown schedules for HFCs. HFCs are produced as replacements for CFCs and thus a result of ODS phase-out. HFCs are not a threat to the ozone layer but have a high GWP. To date, 120 parties to the Montreal Protocol have ratified the Kigali Amendment, which entered into force on 1 January 2019.

Recent Meetings

COP 11/MOP 29: COP 11 and MOP 29 met in November 2017, in Montreal, Canada. COP 11/MOP 29 adopted decisions including on future availability of halons and energy efficiency. They also agreed on a USD 540 million replenishment of the MLF for the triennium 2018-2020.

MOP 30: Convening in November 2018 in Quito, Ecuador, MOP 30 adopted decisions on, *inter alia*: issues important to the January 2019 entry into force of the Kigali Amendment; approved destruction technologies to be used for HFCs; the MLF Executive Committee's progress in developing guidelines for the financing of the HFC phase-down; Article 5 parties' access to energy-efficient technologies in the refrigeration, air conditioning, and heat pump

sectors; a proposal to permit essential use exemptions for HCFCs for specific uses by certain parties; and unexpected increases in CFC-11 emissions.

MOP 31: MOP 31 met in November 2019 in Rome, Italy. The MOP adopted several decisions, the most significant of which were on the terms of reference for the study on the 2021-2023 MLF replenishment, unexpected CFC-11 emissions, and the areas of focus for the 2022 quadrennial assessment reports. MOP 31 also addressed: ongoing reported emissions of CTC; critical use exemptions (CUEs); and issues of non-compliance. Parties were invited to sign the Rome Declaration on the Contribution of the Montreal Protocol to Food Loss Reduction through Sustainable Cold Chain Management.

OEWG 42: OEWG 42 convened on 14, 15 and 16 July 2020 for three identical three-hour sessions to address the TEAP Replenishment Task Force's report on the 2021-2023 MLF replenishment. The sessions were held online due to the COVID-19 pandemic. Parties heard the MLF replenishment needs to take into account not only the HCFC phase-out but also the HFC phase-down. Estimated funding requirements put forward by the TEAP's Replenishment Task Force ranged from USD 376,697,000 to USD 808,706,000. Parties could submit queries during and after the online sessions. Work on the methyl bromide CUEs took place online.

COP 12/MOP 32: Due to the COVID-19 pandemic, COP 12 and MOP 32 convened online in November 2020. Delegates addressed only those issues deemed essential, including the replenishment of the MLF for 2021-2023. Parties authorized the Secretariat to arrange an extraordinary MOP in 2021 to take a decision on the final programme budget for 2021-23. MOP 32 also addressed, *inter alia*: CUEs for methyl bromide for 2021-2022; compliance and data reporting issues; and membership of the Montreal Protocol bodies and assessment panels.

ExMOP 4/OEWG 43 (Part One): With negotiations for the replenishment of the MLF delayed by the pandemic, parties convened a one-day extraordinary MOP (ExMOP) to take a decision allowing some donor countries to make their planned contributions by the end of the fiscal year (June 2021). Immediately following ExMOP 4, the OEWG convened the first part of its 43rd meeting, devoting two days to discussing further work by the TEAP on its MLF replenishment report, which will support the related negotiations scheduled for later in 2021.

OEWG 43 (Part Two) Report

The OEWG reconvened for the second part of its 43rd meeting on Wednesday, 14 July. With the COVID-19 pandemic continuing to prevent in-person meetings, parties gathered virtually to address technical reports on two critical issues: unexpected increase in emissions of CFC-11 and energy-efficient and low-GWP technologies. In order to facilitate participation by parties and stakeholders around the world, each of these issues was addressed in substantively identical sessions on two different days, each of which was scheduled to accommodate a different set of time zones. All discussions of related policy were deferred to the next MOP.

Unexpected Emissions of CFC-11

On 14 and 15 July, participants focused on the unexpected increase in emissions of CFC-11, an ODS that was phased out of production and use in 2010. While emissions and atmospheric

abundances were expected to decrease as a result of this global ban, scientific studies published in 2018 revealed that levels had increased between 2013 and 2018.

On Wednesday, 14 July, OEWG 43 Co-Chair Vizmindia Osorio (Philippines) opened the first of the two identical sessions on CFC-11, outlining the agenda and proposed organization of work (UNEP/OzL.Pro.WG.1/43/2/Add.2). These were adopted without amendment.

Ozone Executive Secretary Megumi Seki recalled that scientific findings in 2018 showed there was an unexpected increase in CFC-11 emissions from unidentified sources, lauding parties for their swift action in requesting the SAP and the TEAP to investigate this matter. She said this year's report shows that, *inter alia*, the recovery of the ozone layer will not be substantially affected by the unexpected increase in emissions.

The SAP summarized its report. He noted the unexpected increase in global CFC-11 emissions—first detected in 2018—emerged in 2013, continued until 2018, and declined in 2019. He stated that relative to the extrapolated global emission decline expected after 2010, there is estimated cumulative global emissions increase of 120 Gigagrams (Gg) up to 2019 as a result of unreported production; relative to the TEAP-modeled global emissions decline expected after 2010, there is an estimated cumulative global emission enhancement of 440 Gg up to 2019 as a result of unreported production. Emissions in 2019, he noted, were made up of emissions from the pre-existing bank in 2010, the post-2010 increase of the bank, and any continued unreported production and use. He said there is insufficient data to ascertain which portion of the current emissions can be attributed to each of the three sources.

Providing an overview of global and regional monitoring stations, he explained that CFC-11 atmospheric quantities are projected to continue to decline, assuming there is future compliance with the provisions of the Montreal Protocol. He said the anticipated recovery of stratospheric ozone will be delayed if substantial amounts of the unreported CFC-11 production were added to foam banks after 2010, but current emission levels will not have a substantial impact.

In its video presentation, the TEAP explained that the unexpected increase in CFC-11 emissions was most likely from blown foam applications, but the emissions cannot be explained by local foam banks. They said it is likely that the CFC-11 was produced from CTC at a large plant with multiple production possibilities. The estimated cumulative total of unreported CFC-11 production is 320-700 kilotons for 2007-2019. They noted a combination of drivers for illegal CFC-11 production and trade, with possibilities including higher pricing and lack of availability of HCFC-141b, ease of reverting to the use of CFC-11, and the belief that flammability might be reduced by using CFC-11 as a blowing agent without the need for expensive fire retardants.

Other highlights from the report included the following.

- Any additional unexpected emissions of CFC-12 are likely a co-product associated with the production of CFC-11.
- The potential opportunity for CFC-11 recovery and destruction lies in improved management of active foam banks at end-of-life, by potentially diverting foam wastes away from landfills towards destruction.
- Future economics and environmental imperatives might improve end-of-life choices.

- More detailed global data (production for each market sector) is needed for the Montreal Protocol to be able to answer future questions on emissions discrepancies.

In the ensuing discussion, representatives of the SAP and the TEAP addressed both pre-submitted and live questions. On a question about where monitoring is lacking, SAP responded that the Middle East and much of Russia have a paucity of monitoring stations. On other potential uses, the TEAP confirmed it is unlikely that CFC-11 was used for any application other than closed-cell foams. On whether the emissions are under control, the SAP said the drop in emissions suggests they are “being controlled,” but more years of emissions data will be needed to confirm whether the emissions are actually under control. On a recently released study that, *inter alia*, infers the lifetime of CFC-11, CFC-12 and CFC-113 using a Bayesian framework, the SAP said that this analysis will be taken into account in the 2022 report. The TEAP said CFC-12 emissions are consistent with emissions releases in the production of CFC-11, but other sources cannot be ruled out.

Other issues addressed included how to fill in emissions monitoring gaps; CFC-11 absorption by oceans; and which countries have large enough plants to manufacture CFC-11.

The session concluded with general statements. AUSTRALIA said it was encouraged by the findings in the SAP report that indicates there may be a decline in the unexpected CFC-11 emissions, and expressed the hope that the 2022 SAP and TEAP reports can shed more light on the issue. She called for further work to improve future estimates and modeling. She urged parties to assess the available information and consider which actions to take, whether as parties to the Protocol or individually as national governments.

MAURITIUS stated almost all Article 5 countries have eliminated CFC-11 and urged those still producing to improve controls so there are no emissions of the chemical, and, consequently, no major impact on the ozone layer. INDIA called for a mechanism to ensure the TEAP and SAP can identify such issues in a timely manner, so adverse impacts are minimized or avoided.

On Thursday, OEWG-43 Co-Chair Martin Sirois (Canada) opened the second session on CFC-11. Participants adopted the same agenda and organization of work, and then watched the same pre-recorded presentations by the SAP and TEAP detailed above.

KUWAIT asked for clarification on the link between emissions of CFC-11 and CTC. Noting there had been a significant change in CTC emissions, the TEAP explained that CTC is a feedstock for CFC-11.

Emphasizing that delays might be small but not insignificant, CANADA requested clarification on the conclusion that the CFC-11 emissions would have only a small impact on the ozone layer. He also called for a comprehensive assessment of CFC-11 banks and asked what data would be needed to refine future estimates. The SAP explained the word “significant” in this context is technical, and specifically refers to a detectable signal that is outside of interannual variability. He said the amount of unreported production that had been emitted would not have a statistically significant impact on the Antarctic ozone hole and global recovery of the ozone layer. With regard to assessments of CFC-11 banks, the TEAP responded that data reported by use is particularly helpful, as different types of products (e.g., refrigerants, foams, etc.) are

associated with different emissions. The SAP noted that any new data that helps the TEAP refine expectations for emissions would also be helpful for the SAP's report.

Underscoring that the successes of the ozone regime are at risk if implementation and monitoring are not enhanced, the EUROPEAN UNION (EU) outlined its pilot project to allow the Ozone Secretariat to work on identifying gaps in atmospheric monitoring of all substances with high impact on ozone. Describing the EU's contribution to this project as seed money, he encouraged parties to contribute either financially or, for Article 5 countries identified as interesting locations, by doing sampling and monitoring work. He also invited parties to signal their interest in participating in intersessional work to prepare a conference room paper on atmospheric monitoring for discussion at the next MOP.

The US, *inter alia*, asked if there is a monitoring site in China and, if so, whether there is any data available from this location. He noted some gaps in monitoring data are more important than others, as some areas have low historical production and use of relevant substances, and called for considering the advice of the SAP when thinking about whether and how to close gaps. On data from China, the SAP noted that the monitoring station is in a building that was constructed using CFC-11, and that observations from this location are therefore contaminated. He underscored that China is making a major effort to monitor CFC-11, cross calibration is important for all stations, and while the SAP is eager to add monitoring stations, the cost is not insignificant.

Co-Chair Sirois thanked the participants closed the technical sessions on CFC-11.

Energy-Efficient and Low Global-Warming-Potential Technologies

On Friday, 16 July, Co-Chair Osorio opened the first of the two substantively identical sessions on energy efficiency. Ozone Executive Secretary Megumi Seki stated that when the Kigali Amendment to phase down HFCs was adopted, climate mitigation was a co-benefit. She said energy efficiency is becoming increasingly important as soaring demand for refrigeration and air conditioning means these technologies now account for approximately 25% of energy usage. She said they expect this demand to continue to climb as extreme weather events become more common. Noting the MOP 31 decision to request the TEAP to provide an update on any new developments with respect to energy-efficient technologies in the refrigeration, air conditioning, and heat pump (RACHP) sector, she expressed the hope that these discussions could serve as the basis for taking the energy efficiency agenda forward at the next MOP.

Co-Chair Osorio introduced the agenda and organization of work (UNEP/OzL.Pro.WG.1/43/2 and Add.3, and UNEP/OzL.Pro.WG.1/43/3/Rev.1), which were adopted without amendment.

The TEAP's Energy Efficiency Task Force (EETF), in its pre-recorded presentation, highlighted key messages from previous reports, including that cooling is essential for meeting the UN Sustainable Development Goals, it is possible to leapfrog from HCFCs directly to lower-GWP refrigerants in higher energy efficient equipment, and synergies with energy efficiency during the HFC phase-down could double climate benefits.

The EETF reported that adopting the best technologies could reduce climate emissions by 130-260 Gigatons CO₂ equivalents over 2030-2050, with 25% of those emissions from HFCs and 75% from reduced electricity usage. It said this would avoid USD

3 trillion in energy and operating costs by 2050 and reduce energy needs by 20%. The EETF also reported that the market for cooling is estimated to grow from USD 135 billion/year in 2019 to USD 185 billion in 2030.

The EETF summarized the 2021 updates on lower-GWP refrigerants with energy efficiency technologies, explaining that energy efficiency of equipment can be improved using advanced technologies; there is the possibility of leapfrogging from HCFCs directly to lower-GWP options while maintaining or enhancing energy efficiency; and coordinating energy efficiency with the HCFC-phaseout and HFC phase-down enables industry to explore possible synergies with respect to equipment redesign.

Access to high energy efficiency, lower-GWP products is improving, the EETF said, but it is still limited in many Article 5 countries and in some non-Article 5 countries. The EETF underscored that manufacturers need to be able to build their technical capabilities to absorb these new technologies. Factors affecting accessibility, the EETF noted, include issues around the supply chain, regulatory environments, affordability, and serviceability. It did, however, note the current trend is that as volumes increase, the cost of more efficient equipment is decreasing, despite the increase in energy efficiency standards.

The EETF went on to describe a synthesis of 27 case studies illustrating developments in best practices. Key messages included: coordination between energy efficiency officials and ozone officers facilitates transition to lower-GWP and more energy efficient equipment; ambitious synergistic HCFC phase-out and HFC phase-down policies with progressive improvement in energy efficiency will benefit parties; avoiding the build-up of a large installed base of low energy efficient equipment protects against creating an economic disadvantage that could last for decades due to the long lifetimes of cooling equipment; and developing and enforcing policies and regulations to avoid the market penetration of low efficiency RACHP equipment could stop environmentally harmful dumping.

The EETF underscored the importance of modeling the benefits of enhancing energy efficiency while phasing down HFCs, and stated modeling can assist in developing Kigali HFC Implementation Plans, inform task force and assessment reports, and provide valuable insights to support Kigali Amendment implementation. Notable findings from the modeling include: energy-related GHG emissions are around 70% of total emissions from the RACHP sector; there is excellent potential to simultaneously reduce both refrigerant and energy-related emissions; early action can halve total cumulative emissions between now and 2050; using heat pumps can create large reductions in fossil fuel emissions; and good models help planning the best phase-down policies.

The EETF went on to propose a draft framework to compile the information from previous reports, thereby assisting parties' understanding by considering options related to capacity building, the servicing sector, manufacturing (assembly and component), and not-in-kind alternatives for the RACHP sector.

On the framework proposal, he said the Montreal Protocol community, including the TEAP, MLF, and implementing agencies, have the unique ability to estimate the potential conversions, supporting policies and enabling activities that would be involved in a synchronized transition to low-GWP alternatives while maintaining or enhancing energy efficiency.

The EETF suggested near-term questions for parties to consider include how to:

- encourage implementation of integrated regulations for energy efficiency during the HFC phase-down;
- improve accessibility to lower-GWP, high-energy efficiency RACHP equipment;
- prevent dumping of high-GWP, low-energy efficiency RACHP equipment into equipment receiving Article 5 countries, to avoid substantial long-term disadvantages; and,
- assist parties wishing to adopt a “fast mover” status with synergistic HCFC phase-out and HFC phase-down with progressive improvement in energy efficiency.

They suggested future steps from the EETF could include expanding modeling work to assess the benefits of integrating energy efficiency and HFC phase-down measures on a regional and global basis; further developing a framework to catalogue the information from the five TEAP/EETF reports, and from other sources to assist parties as they operationalize the Kigali Amendment; and evaluating scenarios to curb the growth of high-GWP HFCs, while integrating energy efficiency.

During the ensuing question and answer session, parties addressed a number of issues. On how the Montreal Protocol can support a green recovery, the EETF noted the Protocol can create a regulatory and policy environment such that any new RACHP equipment purchased is both low-GWP and efficient. On opportunities for leapfrogging, the EETF noted a number of barriers, including a lack of regulatory policies and market signals. The EETF also said the servicing sectors may not be able to deal with more flammable technologies, and urged ozone units to work with energy departments in their respective countries to maximize synergies.

On how domestic actions, such as cooling action plans, can be complemented with MLF funding, the EETF responded that the MLF Executive Committee has recently adopted a decision on some of the HFC planning guidelines. The EETF said they need to study the decision in further detail to better answer this question, but cooling plans are customizable and there is an opportunity to use the cooling plan process to inform HFC planning. The EETF said the specifics will likely be left to parties to decide.

On the lack of consideration of options using hydrofluoroolefins (HFOs), the TEAP stated that these options are not well developed enough to be considered in the report.

The EETF also urged collection of data on a regular basis to improve modeling, highlighted the importance of considering socio-economic factors in modeling scenarios, and encouraged early action in phasing down HFCs using the right regulatory policies.

The UK noted it plans to submit a conference room paper to address future areas of work for the EETF, such as expanding on types of equipment investigated, modeling the impacts of countries adopting an early-mover status—countries who freeze and phase-down their consumption and production of HFCs prior to the mandated schedule in the Kigali Amendment—as well as developing a global HFC and energy efficiency model. MICRONESIA urged continued support for the EETF and suggested it provide annual updates in the future, and encouraged providing further information on refrigeration and air conditioning certification programmes. AUSTRALIA said the report provides good recommendations on institutional arrangements, capacities, and regulatory environments

needed to adopt these technologies, suggesting that labeling schemes and minimum energy performance standards are good foundations for this.

NEW ZEALAND noted it is planning to have net zero emissions by 2050, and the EETF findings will greatly assist with the planning required, including in finding synergies between the HFC phase-down and net-zero planning.

CHINA stated that energy efficiency is of high importance and implementing the Kigali Amendment and improving energy efficiency can provide additional benefits. He said Article 5 countries face numerous obstacles while phasing down HFCs, and urged support for these countries to meet compliance goals. NIGERIA urged parties take into consideration the principle of common but differentiated responsibilities when phasing down HFCs, underscored the importance of energy efficiency in the cold chain to avoid post-harvest losses, and encouraged capacity building to enable technicians to maintain this infrastructure.

Thanking parties for their fruitful discussion and the TEAP for its hard work, Co-Chair Osorio concluded the first session on this issue.

On Saturday, OEWG-43 Co-Chair Sirois opened the second substantively identical session. Participants adopted the same agenda and organization of work, and then watched the same pre-recorded presentation by the EETF detailed above.

In the ensuing discussion, ARGENTINA asked for specific information on improved technologies available in the air conditioning sector, underscored the pressure on ozone units in South America to meet their increasing responsibilities since the adoption of the Kigali Amendment, and underscored the importance of considering national circumstances when recommending actions to improve energy efficiency. The EETF said that the potential leapfrogging is the reason to push for faster technology transfer and acknowledged the need for resources to support transitions to alternative technologies.

CANADA called for a more robust executive summary that would clearly set out the contents of the report. With regard to next steps, she asked which subsectors the task force would recommend addressing and why, and asked whether the additional work proposed in the report should be understood as preparation of reference materials or a more significant project. The EETF replied that commercial refrigeration is one of the sectors that should be the focus of future reports, and clarified that the proposed framework aims to increase the accessibility of the breadth of information and experience within the Montreal Protocol. The EETF also explained that it has sufficient capacity to carry out this project but would need a mandate from the parties.

ARGENTINA asked for more information about low-GWP technologies for domestic air conditioning that are not R-32 refrigerants. The EETF clarified it had listed other available, accessible, low-GWP technology in its report, and further details would be provided in its 2022 report.

KUWAIT noted that safety challenges can make it difficult to adopt new technologies, and called for further examples of what companies are manufacturing and selling. The EETF noted examples of successful projects demonstrating technologies that can work in high ambient temperature climates. Underscoring its immediate compliance obligations related to HCFCs and HFCs, KUWAIT also called for careful planning related to energy efficiency work.

Noting that cooling appliances are increasingly necessary on a warming planet but contribute to climate change, the EU emphasized that proper maintenance is a simple way of keeping efficiency of equipment near its design value. The EU also emphasized that R-32 is not a low-GWP alternative and said natural refrigerants are the preferred way forward.

The US looked forward to further discussion of additional information to be provided by the EETF, noting that information on heat pumps and insulating foams could be helpful.

GRENADA expressed concern regarding the amount of alternatives available in the refrigeration and air conditioning sectors, and underscored the need to develop capacity and ensure the availability of adequate resources to facilitate this transformational process, particularly in low-volume ODS-consuming countries.

Co-Chair Sirois reminded participants that any proposed decisions submitted in advance of the MOP would be made available on the online portal on 13 September.

At the conclusion of the second session on energy efficiency on Saturday, 17 July, OEWG-43 Co-Chair Sirois thanked delegates for their active participation throughout the sessions. He closed the meeting at 6:35 pm EAT (GMT+3).

A Brief Analysis of OEWG-43 Part Two

The second part of the 43rd meeting of the Open-ended Working Group (OEWG) to the Montreal Protocol came in the midst of the ongoing disruption caused by the COVID-19 pandemic. Having dealt with issues related to the funding of the Multilateral Fund during the first part of the OEWG, which met virtually in May, this second part, once again held in a virtual setting, prioritized two technical issues—the unexpected emissions of trichlorofluoromethane (CFC-11) and energy-efficient and low-global-warming-potential (GWP) technologies. Addressing both of these multifaceted issues are crucial to the continuing success of the Montreal Protocol in facilitating the recovery of the ozone layer.

This brief analysis considers the importance of work and discussions undertaken by parties on CFC-11 and energy efficiency and low-GWP technologies, and the implications for the Montreal Protocol.

CFC-11: A Crisis Averted

Scientists' discovery of an unexpected increase in CFC-11 emissions in 2018 presented parties with an urgent challenge, as releases of these ozone-depleting substances (ODS) risked rolling back hard-won progress towards the recovery of the ozone layer. Prior to its ban in 2010, CFC-11 was commonly used as a refrigerant in air conditioning, a propellant in aerosol cans, and a blowing agent for foams and packing materials, among other applications. The unexpected emissions discovered in 2018 were identified as largely coming from northeast China, and in quantities that indicated they must be resulting from illegal production.

Once informed of this development, parties to the Montreal Protocol took swift action to clamp down on illegal production, and atmospheric concentrations once again began to drop. Scientists have measured significant declines in the levels of CFC-11 in the atmosphere, with a drop of 26% between 2018 and 2019 alone. Levels have since returned to pre-2012 concentrations, and the Scientific Assessment Panel concluded that these emissions are unlikely to have a statistically significant impact on the Antarctic ozone hole or global recovery of the ozone layer.

Thus, a more damaging impact was averted by early detection by scientists and the quick actions of parties to investigate and put a stop to illegal activities. For many parties, however, this issue served as a warning about the need to be vigilant and guard against future illegal production and use of this and other ODS. At OEWG-43, several parties underscored the essential role of robust monitoring and enforcement to protect the gains made under the Montreal Protocol. The Scientific Assessment Panel also underlined in its presentation that there are significant gaps in the global observations network, which need to be remedied to ensure such successes in monitoring and enforcement can continue.

To this end, the Ozone Secretariat and European Union (EU) highlighted a pilot project to identify gaps in monitoring and potential locations for new atmospheric monitoring stations, which could be established in partnership with countries around the world. The EU, which described its contribution as “seed money” intended to help launch this initiative, invited parties to join intersessional work ahead of the upcoming Meeting of the Parties, where this issue will be negotiated in much greater detail. Interventions from parties indicated there will also be a need to discuss how best to fill these monitoring gaps, given the substantial cost of establishing monitoring stations and the need to use resources as effectively as possible.

Technological Innovations for a Warming Planet

The second issue prioritized for OEWG-43's technical work related to developments in energy efficiency and low-GWP technologies. The Technology and Economic Assessment Panel's Energy Efficiency Task Force (EETF) presented its 2021 update on these issues, highlighting that transitioning to energy efficient technologies is not only essential for ozone recovery, but it also creates critical co-benefits for the climate. The EETF emphasized the “vicious circle,” also referred to as “the cooling paradox,” created by the growing need for cooling in a warming world, and the role that cooling plays in exacerbating climate change. Relatedly, the EETF emphasized the importance of cooling for achieving the Sustainable Development Goals. For example, cooling technologies are needed to minimize post-harvest losses in the cold food chain, or, more pertinently in these times, for storing medicines and vaccines. They also highlighted the importance of transitioning to low-GWP refrigerants and using equipment with greater energy efficiency; in addition to the emissions decrease, the energy required would drop by 20%.

The Task Force's report on this issue was encouraging, indicating it is possible to leapfrog from technologies using hydrochlorofluorocarbons (HCFCs)—substances being phased out of production and use under the Montreal Protocol, as they are both ODS and greenhouse gases—to more energy efficient equipment using lower-GWP refrigerants. The EETF presented modeling data indicating that synergies with energy efficiency during the phase-down of hydrofluorocarbons (HFCs)—non-ODS introduced as substitutes for HCFCs, but were subsequently found to be potent greenhouse gases—could double the climate benefits of such actions. They also outlined scenarios showing that earlier action of even just a year or two could significantly reduce the total cumulative emissions of HFCs, possibly even halving it by 2050.

This work is critical to the success of the 2016 Kigali Amendment to the Montreal Protocol, which commits parties to cutting production and use of HFCs by 80% by the mid-2040s. The majority of non-Article 5 (developed country) parties have already begun

freezing HFC consumption to meet their commitments to the Kigali Amendment. The majority of Article 5 (developing country) parties do not have to freeze their consumption until 2024. The Task Force's work not only keeps parties apprised of the latest technologies available and their suitability, but it also shows what can be achieved if they take more progressive action. It is hoped that by continuing these updates, parties will be encouraged to take on an early-mover status—this is where countries would take steps to start their freeze and phase-down of HFCs ahead of the timeline set out in the Kigali Amendment—thereby realizing greater gains for the recovery of the ozone layer and reducing climate change.

Parties seemed generally encouraged by the work of the Task Force, with many suggesting possible refinements or areas where further investigations could take place. There is, however, some uncertainty as to how projects relating to the HFC phase-down can be supported by the Multilateral Fund, as the Fund is still finalizing the guidelines. As this was a technical discussion, funding-related issues will have to be taken up at the upcoming MOP, where the discussion to continue the Task Force's work will take place.

Looking Ahead

Parties will convene online in October for the second part of the combined 12th meeting of the Conference of the Parties to the Vienna Convention and 33rd Meeting of the Parties to the Montreal Protocol, with the aim of advancing critical policy-related work. The negotiations will build on the essential technical work carried out by the OEWG, which has facilitated momentum on these urgent issues despite the global disruption caused by the COVID-19 pandemic.

It is hoped that face-to-face meetings will resume in 2022. In the meantime, parties will have to overcome the challenge of negotiating urgent policy matters virtually. While the circumstances are not ideal, the vital importance of the work conducted under the auspices of the Montreal Protocol is clear. The messages coming out of the TEAP and the SAP reports at OEWG 43 reinforced the urgency of steadfast action to protect the ozone layer and, in so doing, contribute to the urgent fight against climate change.

Upcoming Meetings

Fifty-Fourth Session of the IPCC (IPCC-54) and Fourteenth Session of the Working Group I (WGI-14): This meeting of the Intergovernmental Panel on Climate Change (IPCC) will convene to approve the Summary for Policymakers (SPM) of the Working Group I contribution to the IPCC's Sixth Assessment Report (AR6) and acceptance of the underlying scientific technical assessment. After its conclusion, IPCC-54 will meet to accept the actions taken by Working Group I. **dates:** 26 July – 6 August 2021 **location:** virtual **www:** ipcc.ch/meeting-doc/ipcc-wgi-14-and-ipcc-54/

UN Food Systems Summit 2021: The Summit will launch bold new actions to deliver progress on all 17 Sustainable Development Goals, each of which relies to some degree on healthier, more sustainable and equitable food systems. **dates:** September 2021 **location:** UN Headquarters, New York **www:** un.org/en/food-systems-summit/

UN High-level Dialogue on Energy: The High-level Dialogue will be structured around five over-arching themes (energy access; energy transition; enabling SDGs through inclusive, just energy transitions; innovation, technology and data; finance and investment) to ensure an inclusive process for Member States and other stakeholders to identify, develop and accelerate action for universal

energy access, energy transitions and energy's interlinkages with other SDGs. **dates:** September 2021 **location:** UN Headquarters, New York **www:** un.org/en/conferences/energy2021

Combined 12th Meeting of the Conference of the Parties (Part II) and 33rd Meeting of the Parties: The 12th meeting of the Conference of the Parties to the Vienna Convention (COP12) and 33rd Meeting of the Parties to the Montreal Protocol (MOP33) will convene online. Discussions are expected to include, *inter alia*, replenishment of the Multilateral Fund, critical use nominations, unexpected emissions of CFC-11, and energy efficiency and low-global-warming-potential technologies. **dates:** 23-29 October 2021 **location:** virtual **www:** ozone.unep.org/meetings/thirty-third-meeting-parties

UNFCCC COP 26: The 26th session of the Conference of the Parties (COP 26) to the UN Framework Convention on Climate Change, the 16th meeting of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP 16), and the third meeting of the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement (CMA 3) is expected to convene in Glasgow. **dates:** 31 October - 12 November 2021 **location:** Glasgow, Scotland, UK **www:** unfccc.int/process-and-meetings/conferences/glasgow-climate-change-conference

For additional meetings, see <https://sdg.iisd.org/>

Glossary

CFC	Chlorofluorocarbon
CFC-11	Trichlorofluoromethane
COP	Conference of the Parties
CTC	Carbon tetrachloride
CUEs	Critical use exemptions
EETF	Energy Efficiency Task Force
GWP	Global warming potential
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
MLF	Multilateral Fund
MOP	Meeting of the Parties
ODS	Ozone depleting substances
OEWG	Open-ended Working Group
RACHP	Refrigeration, air conditioning, and heat pumps
SAP	Scientific Assessment Panel
TEAP	Technology and Economic Assessment Panel
UNEP	UN Environment Programme