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

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**Thirty-Fourth Meeting of the Parties to
the Montreal Protocol on Substances
that Deplete the Ozone Layer**
Montreal, Canada, 31 October–4 November 2022

Report of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer

Introduction

1. The Thirty-Fourth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer was held at the headquarters of the International Civil Aviation Organization in Montreal, Canada, from 31 October to 4 November 2022.

Part one: preparatory segment (31 October–2 November 2022)

I. Opening of the preparatory segment

2. The preparatory segment was opened by its Co-Chairs, Martin Sirois (Canada) and Osvaldo Álvarez-Pérez (Chile), at 10 a.m. on Monday, 31 October 2022.

Statement by a representative of the United Nations Environment Programme

3. Megumi Seki, Executive Secretary of the Ozone Secretariat, welcomed participants to Montreal, noting that the current meeting was the parties' second to be held in person since the lockdowns imposed as a result of the coronavirus disease (COVID-19) pandemic. Expectations for the meeting were high, in part because it marked the thirty-fifth anniversary of the Montreal Protocol. Part of the agenda would be dedicated to celebrating that milestone, including through a round-table discussion focused on maximizing the potential of the Kigali Amendment to mitigate climate change.

4. The year 2022 was also the fiftieth anniversary of the United Nations Conference on the Human Environment, held in Stockholm in 1972, which had given birth to UNEP and ushered in a new era of increased environmental awareness. During the international event celebrating that anniversary, "Stockholm+50: a healthy planet for the prosperity of all – our responsibility, our opportunity", the Montreal Protocol had been recognized many times as both a success and a source of useful lessons for the global community in addressing the looming environmental crises and the Sustainable Development Goals. Lessons learned could be made even more useful by a targeted approach and fit-for-purpose analyses. The Protocol was currently supporting efforts to establish a science-policy panel for chemicals, waste and pollution by providing detailed information on the assessment process and the work of the assessment panels, which was the cornerstone of informed and sound decision-making by the parties. Noting that the Scientific Assessment Panel had issued the executive summary of its 2022 assessment in time for the current meeting, Ms. Seki took the opportunity to thank it and the other assessment panels for their hard work.

5. Turning to the agenda for the meeting, she observed that, in addition to the key findings of the assessment panels and further work on issues forwarded to the Thirty-Fourth Meeting of the Parties by the Open-ended Working Group at its forty-fourth meeting, the parties had three new issues on their agenda for the meeting, namely alternatives to hydrofluorocarbons (HFC); safety standards; and a proposal by Cuba on the impact of the COVID-19 pandemic on the HFC baselines for parties operating under paragraph 1 of Article 5 (Article 5 parties). She also provided a brief update on staffing at the Secretariat, informing the parties that Gilbert Bankobeza, the acting Deputy Executive Secretary, was set to retire after more than 30 years of service, mainly as the Senior Legal Officer. Maria Socorro Manguiat, a legal expert with over 20 years of experience in international processes, was expected to join the Secretariat from 2023.

II. Organizational matters

A. Attendance

6. The following parties to the Montreal Protocol were represented: Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Cook Islands, Costa Rica, Cuba, Czechia, Denmark, Dominican Republic, Ecuador, Egypt, Estonia, Eswatini, Ethiopia, European Union, Fiji, Finland, France, Gambia, Germany, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Holy See, Hungary, India, Indonesia, Iran (Islamic Republic of), Ireland, Italy, Japan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Liechtenstein, Luxembourg, Malawi, Malaysia, Maldives, Mauritius, Mexico, Micronesia (Federated States of), Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Niger, Nigeria, North Macedonia, Norway, Pakistan, Palau, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Korea, Russian Federation, Rwanda, Saint Lucia, Samoa, Saudi Arabia, Senegal, Seychelles, Singapore, Somalia, South Africa, Spain, Sri Lanka, State of Palestine, Sudan, Suriname, Sweden, Switzerland, Thailand, Timor-Leste, Togo, Trinidad and Tobago, Tunisia, Türkiye, Turkmenistan, Tuvalu, Ukraine, Uganda, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uruguay, Vanuatu, Viet Nam, Yemen, Zambia, Zimbabwe.

7. The following United Nations bodies and specialized agencies were represented: secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, United Nations Development Programme, UNEP, United Nations Industrial Development Organization, World Bank, World Meteorological Organization. The Montreal Protocol assessment panels were also represented.

8. The following intergovernmental, non-governmental, industry, academic and other bodies were also represented: ADC3R; A-Gas America; A-Gas International; AGC Chemicals; Air-Conditioning Heating and Refrigeration Institute; Alliance for Responsible Atmospheric Policy, Arkema – Innovative Chemistry; ATMOSphere; Canadian Space Agency; Chemours, LLC.; Chilean Refrigeration and HVAC Chamber; CLASP; Clean Cooling Collaborative; Climalife; Climate and Clean Air Coalition secretariat; Climate Change Policy and Finance; Concordia University; Daikin; Danfoss (Denmark); Environmental Investigation Agency; European Partnership for Energy and the Environment; Employment and Social Development Canada; GIZ Proklima; Glencoe Strategies, LLC.; Global Policy Associates; Guidehouse; HEAT International; Honeywell Advanced Materials; Industrial Technology Research Institute; Institute for Governance and Sustainable Development; International Institute of Refrigeration; International Pharmaceutical Aerosol Consortium; Japan Fluorocarbon Manufacturers Association; Japan Society of Refrigerating and Air Conditioning Engineers; LAB University of Applied Sciences; Lawrence Berkeley National Laboratory; Leiden University; Lennox International Inc.; Manitoba Ozone Protection Industry Association; McGill University; MEBROM Corporation; Mexichem UK Ltd.; Middlebury College; Natural Resources Defense Council; New York University; Nolan Sherry and Associates Ltd.; NYBRA Consulting; PureSphera; Quimobásicos S.A. de C.V.; Rand Consulting; Refrigerant Gas Manufacturers Association; Refrigerant Reclaim Australia; Refrigerants Australia; Rheem Manufacturing Company; Sessions Educational Services; Shaffie Law and Policy, LLC.; SilverLining; SRF Ltd.; The Energy and Resources Institute; The Japan Refrigeration and Air Conditioning Industry Association; Tradewater; TRANE; University of Massachusetts-Amherst.

B. Adoption of the agenda of the preparatory segment

9. The following agenda for the preparatory segment was adopted on the basis of the provisional agenda set out in document UNEP/OzL.Pro.34/1:
1. Opening of the preparatory segment:
Statement by a representative of the United Nations Environment Programme.
 2. Organizational matters:
 - (a) Adoption of the agenda of the preparatory segment;
 - (b) Organization of work.
 3. Administrative matters:
 - (a) Budget of the Trust Fund for the Montreal Protocol and financial reports;
 - (b) Consideration of the membership of Montreal Protocol bodies for 2023:
 - (i) Members of the Implementation Committee;
 - (ii) Members of the Executive Committee of the Multilateral Fund;
 - (iii) Co-chairs of the Open-ended Working Group.
 4. Terms of reference for the study on the replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the triennium 2024–2026.
 5. Energy efficiency:
 - (a) Response to the report of the Technology and Economic Assessment Panel on decision XXXIII/5 on the continued provision of information on energy-efficient and low-global-warming-potential technologies;
 - (b) Dumping of new and old inefficient refrigeration and air-conditioning appliances (proposal by a group of African States parties to the Montreal Protocol).
 6. Identification of gaps in the global coverage of atmospheric monitoring of controlled substances and options for enhancing such monitoring.
 7. Institutional processes to strengthen the effective implementation and enforcement of the Montreal Protocol.
 8. Ongoing emissions of carbon tetrachloride.
 9. Future availability of halons and their alternatives.
 10. Issues related to exemptions under Articles 2A–2I of the Montreal Protocol:
 - (a) Nominations for critical-use exemptions for methyl bromide for 2023 and 2024;
 - (b) Stocks and quarantine and pre-shipment uses of methyl bromide.
 11. Strengthening the Technology and Economic Assessment Panel and its technical options committees for the phase-down of hydrofluorocarbons and other future challenges related to the Montreal Protocol and the climate.
 12. Consideration of nominations by parties of experts to the Technology and Economic Assessment Panel.
 13. Compliance and data reporting issues: the work and recommendations of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol.
 14. Implementation of the Kigali Amendment:
 - (a) Periodic review on alternatives to hydrofluorocarbons (decision XXVIII/2, para. 4);
 - (b) Status of ratification;

- (c) Impact of the coronavirus disease (COVID-19) pandemic on hydrofluorocarbon baselines for parties operating under paragraph 1 of Article 5 (proposal by Cuba).
 - 15. Safety standards (decision XXIX/11).
 - 16. Recognition of the achievements of Paul Jozef Crutzen, Mario José Molina and Frank Sherwood Rowland, winners of the Nobel Prize in Chemistry in 1995.
 - 17. Other matters.
10. Under agenda item 17, “Other matters”, the parties agreed to consider a proposal by Armenia regarding co-opting at meetings of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol to ensure equal participation of all the regional networks.

C. Organization of work

- 11. The parties agreed to follow their customary procedure and to establish contact groups as necessary.

III. Administrative matters

A. Budget of the Trust Fund for the Montreal Protocol and financial reports

12. Introducing the item, the Co-Chair drew attention to the background information set out in paragraphs 10 to 15 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), the notes by the Secretariat on the revised budget for 2022; proposed budgets for 2023 and 2024 of the Trust Fund for the Montreal Protocol (UNEP/OzL.Pro.34/4 and UNEP/OzL.Pro.34/4/Add.1) and on the financial report for the trust funds for the Vienna Convention for the Protection of Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer for the fiscal year 2021 (UNEP/OzL.Pro.34/5), and notes by the Secretariat entitled “Proposed budgets for 2023 of the trust funds for the Vienna Convention for the Protection of Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer: fact sheets” (UNEP/OzL.Pro.34/INF/1) and “Trust funds for the Vienna Convention for the Protection of the Ozone Layer and for the Montreal Protocol on Substances that Deplete the Ozone Layer: updated indicative financial report for the fiscal year 2022 as at 30 September 2022” (UNEP/OzL.Pro.34/INF/2). A draft decision on the matter was set out in document UNEP/OzL.Pro.34/3 (draft decision XXXIV/[AA]).

13. The parties agreed to follow their standard practice and establish a budget committee to review the proposed budget for the Montreal Protocol trust fund and the financial reports for the Vienna Convention and Montreal Protocol trust funds and to prepare a draft decision on financial matters for the Protocol. It was decided that the committee’s work would be facilitated by Nicole Folliet (Canada).

14. Subsequently, after the budget committee had discussed the matter, the facilitator introduced the draft decision, which included the revised budget for 2022 and the budget for 2023 as agreed by the budget committee and the budget for 2024 as taken note of by the budget committee. She noted that the committee, in addition to making a small number of changes to the budget, had developed a new contribution option and that a document had been posted on the budget portal specifying parties’ 2023 contributions according to the new option.

15. At a later stage in the meeting, the Co-Chair reported that the budget committee had been able to complete its work and had produced a draft decision and budget for consideration by the parties. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

B. Consideration of the membership of Montreal Protocol bodies for 2023

1. Members of the Implementation Committee

16. Introducing the sub-item, the Co-Chair said that the parties needed to decide on the membership of the Implementation Committee for 2023. Information on the positions to be filled was presented in paragraphs 16 to 19 of document UNEP/OzL.Pro.34/2 and a draft decision on the matter was set out in document UNEP/OzL.Pro.34/3 (draft decision XXXIV/[BB]).

17. Subsequently, the representative of the Secretariat reported that, upon receipt of the nominations from the regional groups, a draft decision thereon had been included in the compilation of decisions for the parties' consideration and possible adoption during the high-level segment.

2. Members of the Executive Committee of the Multilateral Fund

18. Introducing the sub-item, the Co-Chair said that the parties needed to decide on the membership of the Executive Committee of the Multilateral Fund for 2023. Information on the positions to be filled was presented in paragraphs 20 to 23 of document UNEP/OzL.Pro.34/2 and a draft decision on the matter was set out in document UNEP/OzL.Pro.34/3 (draft decision XXXIV/[CC]).

19. Subsequently, the representative of the Secretariat reported that, upon receipt of the nominations from the regional groups, a draft decision thereon had been included in the compilation of decisions for the parties' consideration and possible adoption during the high-level segment.

3. Co-chairs of the Open-ended Working Group

20. Introducing the sub-item, the Co-Chair said that the parties needed to decide on the co-chairs of the Open-ended Working Group for 2023. Information on the positions to be filled was presented in paragraphs 24 and 25 of document UNEP/OzL.Pro.34/2 and a draft decision on the matter was set out in document UNEP/OzL.Pro.34/3 (draft decision XXXIV/[DD]).

21. Subsequently, the representative of the Secretariat reported that, upon receipt of the names of the nominations from the groups of Article 5 and non-Article 5 parties, a draft decision thereon had been included in the compilation of decisions for the parties' consideration and possible adoption during the high-level segment.

IV. Terms of reference for the study on the replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the triennium 2024–2026

22. Introducing the item, the Co-Chair drew attention to the information contained in paragraphs 26 to 29 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2) and paragraphs 105 and 106 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP/OzL.Pro.WG.1/44/4). A draft decision on the terms of reference was set out in annex I to document UNEP/OzL.Pro.34/2 and had also been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. No comments on the draft decision had been received on the online forum.

23. The parties agreed to reconstitute the contact group that had discussed the matter at the forty-fourth meeting of the Open-ended Working Group to continue work on the terms of reference. The contact group would be co-chaired by Samuel Paré (Burkina Faso) and Cindy Newberg (United States of America).

24. The co-chair of the contact group informed the parties that participation in the group, which had previously been open-ended, would henceforth be open only to parties.

25. At a later stage in the meeting, the co-chair of the contact group reported that the contact group had been able to complete its work. She expressed her gratitude to participants in the contact group for their hard work and willingness to overcome difficult issues. Welcoming the draft decision, the Co-Chair called on the Technology and Economic Assessment Panel to start work on the study as soon as possible in order to be able to present a preliminary report to the Open-ended Working Group of the Parties to the Montreal Protocol at its forty-fifth meeting.

26. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

V. Energy efficiency

A. Response to the report of the Technology and Economic Assessment Panel on decision XXXIII/5 on the continued provision of information on energy-efficient and low-global-warming-potential technologies

27. Introducing the sub-item, the Co-Chair drew attention to the information contained in paragraphs 30 to 34 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 60 to 88 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4) and the report of the Technology and Economic Assessment Panel of May 2022 entitled “Volume 3: Decision XXXIII/5 – Continued provision of information on energy-efficient and low-global-warming-potential technologies”.

28. He recalled that in decision XXXIII/5, the parties had requested the Technology and Economic Assessment Panel to prepare a report on energy-efficient and lower-global-warming-potential (GWP) technologies and on measures to enhance and maintain energy efficiency during hydrofluorocarbon (HFC) transition in equipment for consideration by the Open-ended Working Group at its forty-fourth meeting. In response to the decision, the Panel had established a task force to prepare the requested report, which had been presented to the Open-ended Working Group at its forty-fourth meeting and was set out in volume 3 of its May 2022 report. At the forty-fourth meeting, a contact group had been established to consider matters raised during the discussion in plenary. The contact group had developed a list of feedback and ideas for further work arising from the Panel’s report. The Working Group had agreed to forward the list to the Thirty-Fourth Meeting of the Parties for further consideration. The list was set out in annex II to the document UNEP/OzL.Pro.34/2 and had also been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. No comments on the list had been received on the online forum.

29. In the ensuing discussion, many representatives reiterated their appreciation for the work on energy efficiency carried out by Technology and Economic Assessment Panel.

30. In response to a request by the Co-Chair for an update on any additional intersessional work related to the list of feedback and ideas for further work, the representative of the United States of America introduced a conference room paper containing a draft decision, submitted by Canada, Norway, the United Kingdom of Great Britain and Northern Ireland and the United States, that focused on a subset of the elements on the list of feedback and ideas for further work produced by the contact group at the forty-fourth meeting of the Open-ended Working Group. The proposal requested the Technology and Economic Assessment Panel to include in its 2023 progress report information on enhancements to energy efficiency associated with improvements in building insulation and appliance foams; information on testing procedures for the validation of energy-efficiency claims to enforce minimum energy-efficiency standards and labels; information on voluntary labelling programmes; information on barriers to the acceptability, to consumers and businesses, of the adoption of more energy-efficient equipment and possible solutions; and analysis of the potential benefits of reducing greenhouse-gas emissions related to the use of refrigeration, air-conditioning and heat-pump equipment. The Panel was also requested to integrate regular updates on energy efficiency in the refrigeration, air-conditioning and heat-pump equipment sector into its progress and quadrennial assessment reports from 2023 onwards. The Secretariat was requested to prepare a report describing examples of existing policies that addressed the interlinkages between the phase-down of HFCs and the enhancement of energy efficiency. Furthermore, parties were encouraged to undertake domestic actions to ensure coordination between energy and ozone officials to enhance energy efficiency in the phase-down of HFCs; to support domestic servicing programmes, including technician training, in order to enhance energy efficiency, improve installation, reduce refrigerant leaks and ensure proper installation and maintenance; and, when phasing down HFCs, to take into account the information contained in volume 3 of the May 2022 report of the Technology and Economic Assessment Panel, as appropriate. The proponents hoped that their proposal could be discussed in a contact group.

31. Another draft decision was introduced by the representative of the Federated States of Micronesia also on behalf of Samoa. It too requested regular reporting by the Technology and Economic Assessment Panel and the provision of information on specific issues required by the parties. The Executive Committee of the Multilateral Fund was requested to strengthen the capacity of national ozone units and Article 5 parties to work on energy-efficiency issues and to leverage energy efficiencies during the HFC phase-down. The Secretariat was requested to support knowledge-building and the exchange of opportunities, an experience that some countries had already

had in the form of initiatives such as buyers' clubs. The proponents also sought to discuss their proposal further in a contact group.

32. Several representatives expressed their concern at the breadth and variety of the elements on the list of feedback and ideas for further work produced by the contact group at the forty-fourth meeting of the Open-ended Working Group. Among their concerns were that the implementation of the Kigali Amendment was already an enormous undertaking and that the vast array of elements in the list would serve only to complicate the task. Furthermore, many of the elements in the list were ill-defined, and it was not clear what they entailed or which entities would be involved in their implementation. Some expressed concern that much of the action fell outside the purview of the Montreal Protocol and the work of national ozone units, such as those relating to minimum energy performance standards, labelling, cooling plans, cold-chain management and nationally determined contributions. Nevertheless, the national ozone units bore the burden of new tasks relating to energy efficiency, including having to coordinate and seek synergies with climate change, energy efficiency or design and planning authorities. They were not equipped to take on such coordination roles.

33. Some representatives also considered that many of the ideas proposed went beyond the scope of the Montreal Protocol. Other representatives expressed the view that the adoption of the Kigali Amendment clearly constituted an agreement by the parties to address energy efficiency issues despite their being outside the core mandate of the Montreal Protocol. Another representative recalled that Article 5 parties had always stepped up to the climate challenge, first by accelerating the phase-out of HCFCs and then by phasing down HFCs. It was now time for them to focus on their core obligations. Energy efficiency was not a compliance issue, yet it was taking up a great deal of time and resources. Another representative stressed the need to strike an appropriate balance between efforts to achieve objectives under the Kigali Amendment and those under the Montreal Protocol and the Vienna Convention.

34. Many representatives, including one speaking on behalf of a group of parties, said that they appreciated the efforts to streamline the focus of future work, but felt that more discussion was required regarding the precise elements to be included in any future draft decision. One proposed that the task force of the Technology and Economic Assessment Panel could engage in demonstration projects; develop a methodology for assessing energy efficiency gains in the implementation of projects supported by the Multilateral Fund; provide an update on the status of adoption of low-GWP alternatives in parties not operating under paragraph 1 of Article 5 (non-Article 5 parties) and the challenges and barriers faced, including in relation to flammable technologies, to help guide industry in developing countries in its choice of alternatives; and provide information on the benefits of energy efficiency in the context of HFC phase-down and on how energy efficiency could be sustained. The representative speaking on behalf of the group of parties proposed focusing on the coupling of different legislative measures on HFC phase-down and energy efficiency requirements; on standards that enabled the safe use of alternatives, especially in high ambient temperatures; and on the technologies that would be most appropriate in the future, not just those readily available at present. Another representative was in favour of a review of energy-efficient and low-GWP technologies.

35. Several representatives drew attention to the need for, and complete lack of, capacity-building and financial support to assist Article 5 parties in undertaking action to enhance energy efficiency. One said that local equipment manufacturers required support in order not to be disadvantaged by the importation of more energy-efficient equipment, while another specified the need for capacity-building in relation to the optimization of energy consumption in buildings. Several representatives stressed the importance of considering the local context when devising action related to energy-efficiency.

36. Many representatives said that they were convinced of the importance of enhancing energy efficiency for climate co-benefits. Several representatives of small island developing States and very-low-volume-consuming countries said that, given the challenges that they faced, any advances in energy efficiency would make a huge difference in their countries. Other representatives highlighted the timely nature of the opportunity to find ways to reduce electricity use and energy costs.

37. The parties agreed to reconstitute the contact group that had discussed energy efficiency matters at the forty-fourth meeting of the Open-ended Working Group, entrusting it with a mandate to discuss the proposed draft decisions, taking into account the comments and ideas expressed in plenary to see whether any of the items needed to be considered further. The contact group would again be co-chaired by Annie Gabriel (Australia) and Bitul Zulhasni (Indonesia).

38. At a later stage in the meeting, the Co-Chair reported that the contact group had been able to complete its work and had produced a draft decision for consideration by the parties.

39. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

B. Dumping of new and old inefficient refrigeration and air-conditioning appliances (proposal by a group of African States parties to the Montreal Protocol)

40. Introducing the sub-item, the Co-Chair drew attention to the information contained in paragraphs 35 to 39 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 94 to 99 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4), and the report of the Technology and Economic Assessment Panel of May 2022 entitled “Volume 3: Decision XXXIII/5 – Continued Provision of Information on Energy-efficient and Low-global-warming-potential Technologies”.

41. He recalled that a draft decision containing a proposal by a group of African States parties to the Montreal Protocol had been introduced for the first time at the Thirty-Third Meeting of the Parties, in 2021, and re-introduced and discussed further at the forty-fourth meeting of the Open-ended Working Group. The Working Group had established a contact group to consider the report of the Technology and Economic Assessment Panel on decision XXXIII/5 and the proposal by a group of African States. The contact group had held a discussion on the general context and background to the proposal and the various elements thereof. Subsequently, the Working Group had agreed to forward the proposal to the Thirty-Fourth Meeting of the Parties for its consideration. The proposal was set out in annex III to document UNEP/OzL.Pro.34/2 and had been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. Subsequently, however, the proponents had submitted a new version of the proposal, updated in the light of the discussions at the forty-fourth meeting of the Working Group. The new version had been posted on the online forum to replace the original draft and was set out in a conference room paper.

42. The representative of Ghana introduced the conference room paper containing the revised draft decision, saying that the dumping of obsolete, new and used cooling appliances in African and other developing countries through exports by parties that had transitioned to more efficient, lower-GWP refrigerants during early phase-out or phase-down of controlled substances represented the exportation of poverty and non-compliance. Differentiated phase-out schedules should not result in the burden of obsolete equipment being shifted to the most vulnerable. He called on the parties to pursue a truly cooperative strategy of stopping dumping in the form of the export of inefficient, high-GWP used and new cooling equipment, and engaging in institutional-strengthening in the form of enabling activities to respond to dumping, stressing that the two parts of the strategy were not interchangeable and would not solve the problem in isolation.

43. One representative indicated her willingness to discuss the matter further in a contact group and proposed that a new contact group be established for that purpose, as substantial work had already been assigned to the contact group established under item 5 (a). Another representative, speaking on behalf of a group of countries, supported the proposal, adding that the submission by the group of African States parties merited the time and attention needed to arrive at a meaningful decision at the current meeting.

44. The parties agreed to establish a contact group, to be co-chaired by Cornelius Rhein (European Union) and Tumu Herowwna Neru (Samoa), to further discuss the draft decision submitted by Ghana on behalf of the group of African States parties.

45. At a later stage in the meeting, the co-chair of the contact group reported that the contact group had run out of time to consider the full text that had been proposed, but had been able to reach agreement on a short draft decision reflecting the core proposal under discussion, on considering the issue further at the Thirty-Fifth Meeting of the Parties and including the item on the agenda of the forty-fifth meeting of the Open-Ended Working Group, taking into account the information requested from parties.

46. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

VI. Identification of gaps in the global coverage of atmospheric monitoring of controlled substances and options for enhancing such monitoring

47. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 40 to 43 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 4 to 8 of the addendum to the note by the Secretariat (UNEP/OzL.Pro.34/2/Add.1) and paragraphs 30 to 42 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4).

48. He recalled that at the forty-fourth meeting of the Working Group, the Secretariat had presented a progress report in response to the request by the parties in decision XXXIII/4, on enhancing the global and regional atmospheric monitoring of substances controlled by the Montreal Protocol. The Secretariat's report had included information on the implementation of the pilot project developed by the Secretariat in 2021 and funded by the European Union, on the regional quantification of emissions of controlled substances. As requested by the Working Group at its forty-fourth meeting, the Secretariat had provided an update to its progress report, which was set out in document UNEP/OzL.Pro.34/2/Add.1.

49. In addition, during the forty-fourth meeting, the European Union had introduced a conference room paper containing a draft decision on identifying sources of emissions originating from industrial processes. The Working Group had agreed to expand the mandate of the contact group established for the carbon tetrachloride discussion to include consideration of the proposal by the European Union, because of the potential links between those two proposals, which both addressed industrial emissions. Owing to time constraints, the contact group had not been able to discuss the proposal and the Working Group had agreed to forward the draft decision to the Thirty-Fourth Meeting of the Parties for its consideration. The draft decision was set out in annex IV to the note by the Secretariat (UNEP/OzL.Pro.34/2) and had also been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. No comments on the draft decision had been received on the online forum.

50. One representative welcomed the opportunity to discuss the draft decision submitted by the European Union in a contact group at the current meeting, but said that while her delegation considered the European Union pilot project a good first step in addressing gaps in monitoring, they also felt that the broader issue of gaps in global monitoring of global substances required further discussion, so requested that the issue be added to the agenda of future Montreal Protocol meetings.

51. Another representative suggested that discussion of the European Union proposal be deferred in view of parties' existing capacities and the ongoing work on the HCFC phase-out and HFC phase-down, particularly as some parties had national systems in place to monitor emissions originating from industrial processes.

52. The parties agreed to reconstitute the contact group established for the carbon tetrachloride discussion at the forty-fourth meeting of the Open-ended Working Group meeting, entrusting it with the mandate of considering the proposal by the European Union. The group would again be co-chaired by Liana Ghahramanyan (Armenia) and Michel Gauvin (Canada).

53. At a later stage in the meeting, the Co-Chair reported that the contact group had been able to complete its work and had produced a draft decision for consideration by the parties.

54. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

VII. Institutional processes to strengthen the effective implementation and enforcement of the Montreal Protocol

55. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 44 to 47 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), the note by the Secretariat on "Possible ways of dealing with illegal production of and illegal trade in controlled substances under the Montreal Protocol, identifying potential gaps in the non-compliance procedure, challenges, tools, ideas and suggestions for improvement" (UNEP/OzL.Pro.34/8) and paragraphs 49 to 53 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4).

56. He recalled that the issue had been considered by the Open-ended Working Group at its forty-fourth meeting. At that meeting, the discussion had been based on the information prepared by the Secretariat for the Implementation Committee in 2019, on possible ways of dealing with illegal trade and production of controlled substances. The same information had been reproduced in document UNEP/OzL.Pro.34/8. The Working Group had produced and forwarded to the Thirty-Fourth Meeting of the Parties a list of ideas for areas of improvement, which was set out in annex V to document UNEP/OzL.Pro.34/2 and had also been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. No comments on the list of ideas had been received on the online forum from parties, although one non-governmental organization had provided comments.

57. The representative of Australia, speaking on behalf also of Norway, the United Kingdom and the United States, introduced a conference room paper setting out a draft decision on the matter. She explained that it contained two main sets of proposals. The first was a series of actions that could be undertaken by parties in the short term: the introduction in their national customs classification system of separate subdivisions for HFCs and blends; encouragement to exchange information and intensify joint efforts to improve means of identification and prevention of illegal trade; and encouragement for the reporting to the Secretariat of fully proved cases of illegal trade. The second was a proposal to continue discussion of the issue in 2023, with the Secretariat updating the information provided in 2019 and providing additional information, all to be discussed at a workshop on further strengthening the effective implementation and enforcement of the Montreal Protocol, to be held back-to-back with the forty-fifth meeting of the Open-ended Working Group.

58. The representative of the United States, speaking on behalf also of Australia and the United Kingdom, introduced a conference room paper setting out a draft decision designed to take forward one of the items raised during the discussions at the forty-fourth meeting of the Open-ended Working Group on this issue. The proposal requested the Technology and Economic Assessment Panel to prepare a report for the Thirty-Fifth Meeting of the Parties providing information on the chemical pathways used at facilities that produced Annex C Group I or Annex F substances that could generate HFC-23 as a by-product, and information on the amount of HFC-23 generated and emitted from such facilities. She suggested that the proposal could be discussed in a contact group together with the proposal introduced by Australia.

59. Representatives welcomed both proposals for draft decisions, although some observed that the implications of the proposals for Article 5 parties, for timelines and for the inputs expected from the Secretariat all needed to be considered carefully. One representative suggested that while the proposal to update the information previously provided in 2019 was welcome, the Secretariat might also be requested to provide suggested guidance and recommendations for parties, which would stimulate more wide-ranging discussions. Another representative suggested that the two proposals for draft decisions were very different, and that the proposal on HFC-23 by-product might be more appropriately considered under agenda item 8, alongside the proposal on continued emissions of carbon tetrachloride, which also pertained to industrial emissions.

60. The Co-Chair thanked representatives for their proposals and comments and suggested that since both proposals had arisen from the same discussion at the Open-ended Working Group, it would be appropriate to continue considering them together. Accordingly, the parties agreed to establish a contact group on strengthening the institutions of the Montreal Protocol, to be co-chaired by Miruza Mohammed (Maldives) and Andrew Clark (United States), who had facilitated the informal group discussions at the forty-fourth meeting of the Open-ended Working Group.

61. Subsequently, after discussions in the contact group, the co-chair of the contact group introduced a revised draft decision on strengthening institutional processes with respect to information on HFC-23 by-product emissions.

62. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

63. At a later stage in the meeting, the co-chair of the contact group reported that the contact group had been able to complete its work. He introduced a draft decision on strengthening Montreal Protocol institutions, including for combating illegal trade.

64. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

VIII. Ongoing emissions of carbon tetrachloride

65. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 48 to 52 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2) and paragraphs 170 to 175 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4).

66. He recalled that a draft decision on carbon tetrachloride had first been introduced by Switzerland and discussed at the Thirty-First Meeting of the Parties, in 2019. Switzerland had revised the proposal a number of times before and during the forty-fourth meeting of the Open-ended Working Group, in order to reflect comments from their parties during which a contact group had been established to discuss the matter. The Open-ended Working Group, during which a contact group had been established to discuss the matter had agreed to forward the resulting draft decision, containing further changes, to the Thirty-Fourth Meeting of the Parties for further consideration. The draft decision was set out in annex VI to the note by the Secretariat (UNEP/OzL.Pro.34/2) and had also been posted on the online forum to facilitate an exchange of views by parties prior to the current meeting. No comments on the draft decision had been received on the online forum.

67. The representative of Switzerland said that further discussions intersessionally and at the current meeting had resulted in some proposed revisions to the draft decision, which would be presented to parties in a conference room paper. The parties agreed that the contact group established under item 6 would consider the matter further with the mandate to continue the discussion on the draft decision.

68. Subsequently, the representative of Switzerland introduced a draft decision set out in a conference room paper. He said that the draft decision aimed to help close existing knowledge gaps on emissions of carbon tetrachloride by inviting parties with industrial processes in their countries involving carbon tetrachloride to provide relevant information to the Secretariat to assist the Technology and Economic Assessment Panel in developing a greater understanding of the processes involved. As part of a step-wise approach, the data and information generated would assist parties in developing goal-oriented mitigation measures.

69. As previously agreed by the parties, the draft decision was forwarded to the contact group established under item 6 for further consideration.

70. At a later stage in the meeting, the Co-Chair reported that the contact group had been able to complete its work and had produced a draft decision on ongoing emissions of carbon tetrachloride for consideration by the parties.

71. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

IX. Future availability of halons and their alternatives

72. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 53 to 56 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 135 to 139 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4) and an advance version of volume 1, section 3, of the May 2022 progress report of the Technology and Economic Assessment Panel on the future availability of halons and their alternatives.

73. He recalled that, at the forty-fourth meeting of the Open-ended Working Group, in July 2022, when the parties had discussed the issue, it had been noted that the Technology and Economic Assessment Panel was due to provide updated information in its forthcoming 2022 quadrennial assessment report. In the light of that, the Working Group had agreed to defer further consideration of the item to 2023, but at the same time to add the issue to the agenda of the current Meeting of the Parties to allow the discussion to continue if needed before the publication of the report.

74. One representative observed that the issues of halon management that the Technology and Economic Assessment Panel had brought to the parties' attention remained paramount, and that the information and guidance that had been included in the report, including guidance from the Halon Recycling Corporation, was extremely useful and would be helpful to parties to reference in management of stocks of halons. She expressed the hope that all parties should exercise the utmost care in managing stocks of recovered, recycled and reused halons and should consider this in their domestic actions.

75. The parties took note of the information provided.

X. Issues related to exemptions under Articles 2A–2I of the Montreal Protocol

A. Nominations for critical-use exemptions for methyl bromide for 2023 and 2024

76. Introducing the sub-item, the Co-Chair drew attention to the information set out in paragraphs 57 to 59 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 9 to 18 of the addendum thereto (UNEP/OzL.Pro.34/2/Add.1), paragraphs 127 to 131 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4) and volume 4 of an advance version of the September 2022 final report of the Technology and Economic Assessment Panel on the evaluation of 2022 critical-use nominations for methyl bromide and related issues.

77. He recalled that, at the forty-fourth meeting of the Open-ended Working Group, the Methyl Bromide Technical Options Committee had presented its interim evaluation of the critical-use nominations received from three parties, comprising one nomination by an Article 5 party (South Africa) for 2023, and one nomination each by two non-Article 5 parties (Australia and Canada) for 2024 and 2023, respectively. The Committee had produced its final report and recommendations in September 2022.

78. The co-chairs of the Methyl Bromide Technical Options Committee, Marta Pizano and Ian Porter, gave a presentation on the Committee's final assessment of critical-use nominations for methyl bromide. A summary of the presentation is set out in section A of annex I to the present report.

79. In the ensuing discussion, one representative sought clarification of the statement in the presentation that 10,000 tonnes of methyl bromide was still used for exempted uses for quarantine and pre-shipment, but uncertainty over classification for that category meant that further critical-use nominations might arise in the future. Mr. Porter responded that while the definitions of the various categories under the Protocol were clear, several industries using methyl bromide still found it difficult to identify whether a treatment could be categorized as a quarantine or pre-shipment use or neither, as a consequence of which some critical uses were currently not being sought under the critical-use process.

80. The representative of South Africa said that the national plan to phase in alternatives to the use of methyl bromide for structural fumigation by 2024 was on track, and the party had agreed to the Committee's final recommendation of 19 tonnes for 2023.

81. The representative of Canada, referring to her country's critical-use nomination, said that Canada remained committed to phasing out methyl bromide, and had reduced usage of methyl bromide by 92 per cent since 2005. However, efforts to introduce alternatives to methyl bromide use in the strawberry runners industry on Prince Edward Island had faced a number of challenges. While the shift to indoor cultivation was yielding promising results, further time was needed to conduct research and undertake the necessary structural and technological investment. The party was therefore disappointed in the final recommendation of 3.857 tonnes, which was 25 per cent below the nomination of 5.017 tonnes and did not reflect the current needs of the industry. Furthermore, the process by which the Committee had reached its conclusion had lacked transparency and was not consistent with the working procedures of the Methyl Bromide Technical Options Committee relating to the evaluation of nominations for critical uses of methyl bromide as set out in annex I to the report of the Sixteenth Meeting of the Parties, in accordance with decision XVI/4. The party intended to discuss the matter further with the co-chairs of the Committee.

82. The representative of Australia, referring to his country's critical-use nomination, expressed disappointment at the decision of the Methyl Bromide Technical Options Committee not to recommend a critical-use exemption for 2024 for strawberry runner nurseries. With regard to the co-formulation of methyl iodide and chloropicrin as an alternative to methyl bromide, the process for registration of new chemicals in Australia was complex and potentially lengthy, as a consequence of which the timeline for transition to the new formulation was uncertain, with implications for the 2023 and 2024 nominations. As in the case of the Canada nomination, the decision of the Committee failed to adequately take into account the challenges facing the party in implementing alternatives in the industry, and was not in keeping with its established working procedures. Australia intended to submit

a conference room paper setting out a draft decision on the matter, also on behalf of Canada and South Africa.

83. One representative said that it was crucial that the Methyl Bromide Technical Options Committee follow its designated procedures and fully take into account the information submitted by parties. Another representative, speaking on behalf of a group of countries praised the efforts in phasing out methyl bromide of Argentina, which had not sought a critical-use nomination in the present round, and South Africa, which had not put forward a nomination for 2024. She expressed concern that some parties continued to seek critical-use nominations when alternatives existed for methyl bromide use, and she welcomed further discussion of how those parties could achieve alignment with the recommendations of the Committee and the requirements of decision IX/6.

84. The parties agreed that interested parties would undertake further informal discussions on the matter, led by Australia, with the objective of developing a draft decision on critical-use nominations for methyl bromide for the consideration of the parties.

85. Subsequently, the representative of Australia submitted, also on behalf of Canada and South Africa, for the consideration of the parties, a draft decision set out in a conference room paper presenting the proposed critical-use nominations for Australia, Canada and South Africa in line with the interventions made by those parties at the current meeting.

86. The parties agreed that the co-sponsors of the draft decision would continue to consult informally with interested parties in order to develop a revised version of the draft decision.

87. At a later stage in the meeting, the representative of Australia introduced a revised proposal for a draft decision. He explained that the revisions included the addition of more explanation about the situations in Australia and Canada, and also to note with appreciation that South Africa had committed not to apply for critical-use nominations of methyl bromide in the future. In addition, there were changes in the volumes of critical-use nominations for Australia and Canada for 2023, and Australia's nomination for 2024 had been withdrawn.

88. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

B. Stocks and quarantine and pre-shipment uses of methyl bromide

89. Introducing the sub-item, the Co-Chair drew attention to the information set out in paragraphs 60 to 65 of and annex VII to the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), and paragraphs 155 to 164 of the report of the forty-fourth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (UNEP/OzL.Pro.WG.1/44/4).

90. He recalled that, at the forty-fourth meeting of the Open-ended Working Group, the European Union, Norway and Switzerland had submitted a draft decision on stocks and quarantine and pre-shipment uses of methyl bromide. After further discussion and revision of the draft decision, the Open-ended Working Group had agreed to forward the draft decision to the Meeting of the Parties for its consideration, on the understanding that interested parties could continue informal consultations on the matter during the intersessional period. The draft decision was set out in annex VII to document UNEP/OzL.Pro.34/2.

91. The representative of the European Union, introducing a conference room paper setting out the draft decision submitted by the European Union, Ecuador, Norway and Switzerland, said that action proposed in the draft decision would help increase knowledge of stocks and uses of methyl bromide and would assist parties in identifying alternatives to methyl bromide and reducing emissions.

92. In the ensuing discussion, several representatives expressed support for initiatives that would promote the use of alternatives and acknowledged the value of gathering data to support that process. It was necessary, however, to ensure that data were gathered and submitted on a voluntary basis, and to acknowledge the difficulties that might be faced in gathering proprietary data from businesses. Concern was also expressed about the value of the data gathered and how it might be used. One representative said that in developing the draft decision consideration needed to be given to whether the Methyl Bromide Technical Options Committee had the mix of skills in its membership necessary to address the issues, and whether clearer guidance needed to be given to the Committee.

93. The parties agreed to establish a contact group, to be co-chaired by Alain Wilmart (Belgium) and Diego Montes (Colombia), to further discuss the matter and produce a revised version of the draft decision for consideration by the parties.

94. At a later stage in the meeting, the Co-Chair reported that the contact group had been able to complete its work and had produced a draft decision for consideration by the parties.

95. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XI. Strengthening the Technology and Economic Assessment Panel and its technical options committees for the phase-down of hydrofluorocarbons and other future challenges related to the Montreal Protocol and the climate

96. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 66 to 71 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), and section 8 of volume 1 of the May 2022 progress report of the Technology and Economic Assessment Panel.

97. He recalled that at the forty-fourth meeting of the Open-ended Working Group in July, the parties had considered a draft decision originally submitted by Morocco in 2020, on strengthening the Technology and Economic Assessment Panel and its technical options committees; recommendations made by the Technology and Economic Assessment Panel in its progress report on its restructuring to meet future challenges; and other ideas that parties had put forward during the meeting. The discussion was summarized in the report of the forty-fourth meeting of the Working Group. The proposal by Morocco was set out in annex VIII to document UNEP/OzL.Pro.34/2.

98. Parties had agreed to continue to work on the matter intersessionally and also to resume discussions at the current meeting. The co-chairs of the contact group that had been established to consider the matter had also collated a list of questions to be put to the Technology and Economic Assessment Panel, and, in October, the Panel had issued a response, which had been posted on the online forum, together with the Panel's own recommendations.

99. Several representatives expressed their desire to continue to discuss the matter following the very useful discussions at the forty-fourth meeting of the Open-ended Working Group. Issues that they said they would like to take up included the Panel's proposals for restructuring its technical options committees, and whether there were any alternative solutions to the challenges and means of ensuring the availability of sufficient expertise on new issues, such as energy efficiency. Representatives said that it was important to ensure that the work of the Technology and Economic Assessment Panel and its technical options committees remained in line with the needs of parties.

100. The parties agreed to establish a contact group, to be co-chaired by Paul Krajnik (Austria) and Maria del Mar Solano (Costa Rica), on strengthening the Technology and Economic Assessment Panel and its technical options committees for the phase-down of HFCs and other future challenges related to the Montreal Protocol and the climate. The Co-Chair of the preparatory segment encouraged the contact group to focus on identifying points of convergence, which could potentially be included in a draft decision, and also to identify proposals which were clearly not acceptable and which therefore would not need to be discussed further.

101. Subsequently, the representative of Australia, speaking also on behalf of Canada, the United Kingdom and the United States, introduced a proposal for a draft decision set out in a conference room paper. She explained that it was designed to take forward one of the proposals put forward by the Technology and Economic Assessment Panel in its progress report, namely the renaming of the Halons Technical Options Committee as the Fire Suppression Technical Options Committee, in recognition of the fact that the committee now had a broader scope than just halons.

102. With regard to the Panel's other proposals, she suggested that further consideration was needed, and the draft decision therefore requested the Panel to provide potential options for the future configuration of its foam and refrigeration technical options committees for consideration by the Open-Ended Working Group at its forty-fifth meeting, taking into account: previous discussions; the fact that the vast majority of HFC uses were in the refrigeration, air-conditioning and heat pumps sector; the expertise required to inform the parties of upcoming challenges related to the implementation of the Kigali Amendment; and guidance provided in its terms of reference on the structure and size of technical options committees as well as on gender and regional balance. She stated that she would welcome the views of other parties on the proposals.

103. At a later stage in the meeting, the co-chair of the contact group reported that the contact group had been able to complete its work and had produced a draft decision for consideration by the parties.

104. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XII. Consideration of nominations by parties of experts to the Technology and Economic Assessment Panel

105. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 71 to 79 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 19 to 23 of the addendum thereto (UNEP/OzL.Pro.34/2/Add.1), the matrix of needed expertise and a primer on the operation of the Technology and Economic Assessment Panel.

106. The Co-Chair recalled that at the forty-fourth meeting of the Open-ended Working Group, in July 2022, the issue of nominations of experts by the parties to the Technology and Economic Assessment Panel had been briefly discussed. Parties wishing to nominate experts had been encouraged to consult the Panel and other interested parties in the margins of the Working Group meeting.

107. The list of members of the Panel whose membership expired at the end of 2022 was set out in document UNEP/OzL.Pro.34/2. A total of seven nominations had been received from parties to date. The Co-Chair urged the parties that were interested in making nominations to do so as soon as possible and to take the matrix of needed expertise that had been provided by the Panel into consideration when nominating experts. He suggested the establishment of an informal group of nominating and interested parties to discuss and agree on the nominations.

108. Representatives agreed to the proposal that further discussion was necessary. One observed that some experts who had been nominated to the Panel and its technical options committees, including some of senior experts put forward so far, did not appear to possess the expertise that was required, and said that she would welcome the chance to discuss the matter further. She also noted the linkage to the discussions under agenda item 11.

109. The parties agreed to establish an informal group of nominating and interested parties to discuss and agree on the nominations. The Secretariat would assist the group and prepare a draft decision containing the agreed nominations for appointment.

110. At a later stage in the meeting, the Co-Chair reported that the informal group had been able to complete its work and had produced a draft decision for consideration by the parties.

111. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XIII. Compliance and data reporting issues: the work and recommendations of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol

112. The Vice-President and acting President of the Implementation Committee, Gene Smilansky (United States), presented a report on the outcomes of the sixty-eighth and sixty-ninth meetings of the Committee, including an overview of the draft decisions approved by the Committee for consideration by the Thirty-Fourth Meeting of the Parties. Both meetings had taken place in person, after two years of online meetings in 2020 and 2021.

113. The Committee had considered a broad range of issues this year, including various aspects of data reporting, compliance with control measures, and the establishment and operation of licensing systems for HFCs. It had also received a report from the secretariat of the Multilateral Fund on relevant decisions of the Executive Committee of the Fund and on activities carried out by the implementing agencies to facilitate compliance by parties. The Committee had reviewed existing decisions on non-compliance by a number of parties, dealing either with their data reporting obligations under Article 7 or with commitments contained in their respective plans of action to return to compliance. The Vice-President drew attention to a conference room paper setting out the three draft decisions which the Committee had forwarded for the consideration of the parties.

114. The first draft decision related to data reporting under Article 7 of the Montreal Protocol. It confirmed that parties had a strong record of reporting, with 194 of the 198 parties to the Protocol having reported data for 2022. It noted with concern a number of cases of non-compliance with parties' data reporting obligations: Afghanistan, the Democratic Republic of the Congo, Israel and the Russian Federation had not yet reported their 2021 data; San Marino, a party to the Kigali Amendment, had not submitted its baseline data for HFCs for the period 2011–2013; and Somalia, also a party to the Kigali Amendment, had not submitted its baseline data for HFCs for 2021. The draft decision urged those parties to submit the data as a matter of urgency, and requested the Committee to consider all the cases further at its seventieth meeting. The draft decision also highlighted the need for timely data reporting by parties for effective monitoring and assessment of parties' compliance with their obligations under the Montreal Protocol.

115. The second draft decision related to licensing systems for HFCs under Article 4B, paragraph 2 bis, of the Montreal Protocol. The Vice-President observed that the successful phase-out of most controlled substances by parties was largely attributable to the implementation of licensing systems to control their import and export. The draft decision therefore recognized the role of licensing systems in data collection and verification, monitoring of imports and exports of controlled substances, and the prevention of illegal trade.

116. Each party to the Kigali Amendment was required by 1 January 2019 or within three months of the date of entry into force of the Amendment for that party, whichever was later, to establish and implement a system for licensing the import and export of new, used, recycled and reclaimed controlled substances listed in Annex F. The draft decision noted with appreciation that 117 of the 139 parties to the Amendment had established such licensing systems, together with a further 8 parties that had not yet ratified the Amendment. It listed the 15 parties to the Amendment which should have reported the establishment of their licensing system but had not yet done so, and urged them to provide the information to the Secretariat as a matter of urgency and no later than 15 March 2023. The matter would be considered further by the Committee at its seventieth meeting.

117. The final draft decision concerned the request from Madagascar for the revision of its baseline data for hydrochlorofluorocarbons (HCFCs) for the year 2009. It stated that Madagascar had presented sufficient information, in accordance with decision XV/19, which set out the methodology for the submission of such requests, to justify its request for the revision of its consumption data for 2009, which was one of the HCFC baseline years for Article 5 parties, and approved the party's request to revise its HCFC consumption data for the baseline year 2009 accordingly.

118. The Vice-President concluded by thanking his colleagues on the Implementation Committee for their constructive engagement and support throughout the year. He also expressed his deep appreciation for the immense amount of help and advice that Mr. Bankobeza had given to the Committee, not just over the previous year, but since its inception.

119. The parties agreed to forward the set of draft decisions for further consideration and possible adoption during the high-level segment.

XIV. Implementation of the Kigali Amendment

A. Periodic review on alternatives to hydrofluorocarbons (decision XXVIII/2, para. 4)

120. Introducing the sub-item, the Co-Chair drew attention to the information set out in paragraphs 82 to 87 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 24 to 28 of and annex II to the addendum thereto (UNEP/OzL.Pro.34/2/Add.1) and volume 5 of the September 2022 report of the Technology and Economic Assessment Panel entitled "Decision XXVIII/2 TEAP Working Group Report Information on Alternatives to HFCs."

121. He recalled that the Panel had suggested that the parties might wish to consider aligning future periodic reviews, due every five years pursuant to decision XXVIII/2, with the quadrennial assessment reports, to enable the Panel to manage its workload better and to minimize duplication of effort.

122. The report on alternatives to HFCs was presented by Bella Maranion, Co-Chair of the Technology and Economic Assessment Panel; Ray Gluckman, senior expert and member of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee; Helen Walter-Terrinoni, co-chair of the Flexible and Rigid Foams Technical Options Committee; Helen Tope, co-chair of the Medical and Chemicals Technical Options Committee; and Adam Chattaway, co-chair of the Halons Technical Options Committee. A summary of the

presentation is set out in section B of annex I to the present report. Following their presentation, they provided additional information and clarifications in response to questions and comments from representatives.

1. Question-and-answer session

(a) Refrigeration, air conditioning and heat pumps

123. Following the presentation, in response to questions, Mr. Gluckman followed up on his assertion that there were suitable low-GWP solutions for small and large cooling systems but that medium-sized systems were more problematic. It was difficult, he said, to define what constituted a small or medium system, as it depended on technology and region. For instance, propane could be substitute for HFC-32 in smaller systems, with safety regulations allowing for a charge of up to 1 kg of propane, but once the system became larger or the layout more complex, a larger charge would likely be required. In high-ambient-temperature countries, a much bigger cooling load was required for a given room size, meaning that “medium” would have a different meaning in cooler regions than in high-ambient-temperature regions. With regard to the impact of using lower-GWP gases, he stressed the close link between reducing the size of refrigerant charge and the ability to maximize energy efficiency, and suggested that there might be a point at which the energy efficiency gains outweighed the benefits of HFC reduction.

124. Mr. Gluckman also expounded on his description of the use of flammable refrigerants as “more problematic” in medium-sized equipment. With a very small charge, he explained, the risk of what might occur as the result of a leak was very small, and there was thus high confidence when using highly flammable (class A3) refrigerants in domestic refrigerators and small stand-alone commercial equipment with a few hundred grams of refrigerant. As system size increased, however, design engineers needed to put more thought into design and what the safety code allowed for a given room size. Industry was still learning about the use of alternatives in larger systems: for instance, in variable refrigerant flow (VRF) air-conditioning systems, which used 40–50 kg of refrigerant and were very popular for hotels and mid-sized office blocks, industry was just beginning to use A2L class (mildly flammable) refrigerants like HFC-32. Responding to a question about mobile air conditioning, Mr. Gluckman confirmed that low-GWP alternatives were currently in use in electric vehicles.

125. Asked about commercial refrigeration, Mr. Gluckman said that there were generally more very-low-GWP options for refrigeration than for air conditioning. Small stand-alone commercial refrigeration equipment was already rapidly migrating to hydrocarbons, much like domestic refrigerators. Technically, however, the recommendation would almost always be to avoid retrofitting equipment designed for non-flammable refrigerant with a flammable refrigerant, which immediately placed constraints on retrofitting given that many of the alternatives were flammable. There were also non-flammable alternatives that could be retrofitted, however, such as R-448A and R-449A, which could easily be retrofitted into existing R-404A systems. For a range of technical reasons, it was easier to retrofit HFC systems to new HFC-HFO blends than it had been to retrofit HCFC systems to HFCs.

126. Addressing a question on the accessibility of alternatives given the working group’s finding that limited accessibility for Article 5 parties was a key issue, Mr. Gluckman said that training needed to be put in place, for technicians, clearly, but also for the engineering teams that designed and specified refrigeration systems, who needed to be made aware of the alternative technologies. Mature technologies were available, and the development of Kigali HFC implementation plans (KIPs) and the activities of OzonAction should help to raise awareness of such technologies and begin to increase accessibility. He noted that technology maturity was regional, however, with some alternative technologies mature in places like Europe or Japan but not yet in high-ambient-temperature regions. Countries might consider indicating their interest to the technology providers to help accelerate the process.

127. Regarding the split of technologies within the air-conditioning sector, the situation varied considerably from country to country. In northern European climates, for instance, heat pumps could be expected to become dominant, while in Article 5 parties, air conditioning would dominate. Air-conditioning systems could be subdivided into room air conditioning and commercial (non-residential) building air conditioning, with the split again varying from one country to another depending on market maturity and climate. Flammable refrigerants had only been used in air-conditioning applications for five or six years and the size range of what suppliers were able to safely install was rising steadily, making it difficult to estimate how the market would evolve; nevertheless, the new international safety standard for household and similar electrical appliances (IES 60335-2-40) could be expected to have an impact.

(b) Foams

128. Asked about the energy performance and thermal conductivity of alternatives to HFCs in the foam sector, Ms. Walter-Terrinoni said that the working group's report contained a number of relevant comments for each sector. She confirmed that HFCs and hydrocarbons were sometimes being used in foam blends to balance cost and energy. Refining the blend of blowing agents to maximize energy efficiency was especially challenging in high ambient temperatures, as was the high temperature and pressure relationship and off gassing of the foam blowing agent. The unique challenges of high-ambient-temperature countries would be discussed in more detail in the final assessment report, which would also have a section on life-cycle analysis and balancing cost and energy efficiency.

129. On the question of the accessibility of alternatives, she noted that there had been supply chain problems in the foam sector throughout the pandemic, as well as what the technical options committee viewed as a likely mismatch between capacity and demand. The committee intended to discuss the matter in more depth in the assessment report, as well as what might be done to resolve some of the accessibility issues.

130. Responding to a question about the importance of foams for energy efficiency in appliances, Ms. Walter-Terrinoni noted that energy efficiency standards generally considered the thermal performance of foams to be a design feature of equipment and often supplied a menu of design feature options. Good foam performance could be paramount in meeting newer, more stringent energy efficiency standards. She confirmed that there was potential for foam insulation manufacturers to revert to fluorocarbons, particularly in areas where energy efficiency was especially important, such as in building panels, appliances and refrigeration equipment. The issue was currently an emerging one and it was not yet clear how it would evolve.

(c) Medical and chemical

131. Providing additional information on the use of alternatives in aerosols in the medical sector, Ms. Tope said that dry powder inhalers and aqueous soft mist inhalers were alternatives to HFCs in aerosols but were not universally available, accessible or suitable. Various factors influenced the choice of inhaler, including the way doctors prescribed medicines, availability, accessibility, cost, patient preference, and even national government guidance for applicable treatments. A lot of work was being done on new, in-kind alternative propellants with lower-GWP for metered-dose inhalers, although they were still in the early stages of development; additional information would be provided in the final assessment report.

132. Regarding accessibility, inhaled therapy was not universally accessible across all products, drugs or regions, with substantial variations globally. The underlying reasons included regulatory drug approvals, health policy, the presence of pharmaceutical companies in a given market, and patient and prescriber preferences. In some Article 5 parties, metered dose and dry powder inhalers were less accessible than in non-Article 5 parties. Commercially available medications in soft mist inhaler format were limited to short- or long-acting bronchodilators, which were primarily used for the treatment of chronic obstructive pulmonary disease and could not replace asthma attack treatments, for instance. Soft mist inhalers were also likely to be far less commercially available and successful in Article 5 parties than in non-Article 5 parties. In terms of cost, single-dose dry powder inhalers could be more affordable than metered-dose inhalers; in India, for instance, the market was very reliant on single-dose dry powder inhalers, which were a very affordable alternative to both the HFC metered-dose inhalers and multi-dose dry powder inhalers. In addition, in Article 5 parties, locally made metered-dose inhalers were more affordable than imported brands. A few companies had indicated that they planned to launch new metered-dose inhalers with lower-GWP alternatives in 2025, although that outlook presumed their successful completion of the complicated approval process in each country.

133. Regarding the use of HFCs in semi-conductor production, Ms. Tope explained that HFCs were used with a plasma to generate reactive fluorine species, with emissions arising from HFC gas that was not converted into the reactive species to etch the silicon wafers. Emission abatement systems were increasingly but not always used. More information would be provided in the final assessment report.

(d) Halons

134. Asked why 2-BTP was not cited as an alternative for fire suppression for aircraft engine nacelles and auxiliary power units even though it had been approved for use under the United States Environmental Protection Agency's Significant New Alternatives Policy Program in 2016, Mr. Chattaway explained that 2-BTP had been under active investigation for aircraft engine nacelle fire protection almost two decades ago but had failed a key minimum performance standard test that was a necessary stepping stone to commercialization and use. As a result, 2-BTP was not currently

under active investigation for that particular application and had therefore not been considered in the report. Two alternative agents, CF3I and a sodium bicarbonate-based dry chemical aerosol, were currently under active investigation and were likely to be commercialized.

(e) **Per- and polyfluoroalkyl substances (PFAS)**

135. Members of the working group addressed concerns raised by a number of representatives regarding the impact of developments in the identification and regulation of per- and polyfluoroalkyl substances (PFAS). They acknowledged that the issue was of concern across all sectors, particularly because of the way in which PFAS was defined, and was likely to have an impact on the alternatives considered in the report. The Technology and Economic Assessment Panel was monitoring how PFAS definitions were developing and the related policies were evolving, but relied heavily on the scientific expertise of the Environmental Effects Assessment Panel, which was closely following the matter. The working group members also noted that the review of alternatives to HFCs had been limited in scope, and that the final assessment report would contain more information on the implications of PFAS definition and regulation.

2. **General discussion**

136. Following the question-and-answer session, the Co-Chair opened the floor for a more general discussion on the report by the Technology and Economic Assessment Panel and the periodic review of alternatives to HFCs.

137. All the representatives who took the floor, both in the question-and-answer session and the general discussion, thanked the Panel for its work. Several of them noted the importance of the issue of alternatives to HFCs. It had been critical at the time of adoption of the Kigali Amendment and remained so six years later.

138. Referring to the situation faced by small and medium-sized enterprises in the foam sector, one representative stated that access to hydrochlorofluoro-olefins (HCFOs) was a major challenge for her country, owing to the prohibitive prices caused by production backlogs and exacerbated by delays in cargo shipments following the COVID-19 pandemic. The cost of such alternatives was much higher than had been foreseen by HCFO enterprises at the time of the adoption of the Kigali Amendment, and it was imperative that the issue be addressed under the Montreal Protocol.

139. One representative said that, although he saw merit in aligning the periodic review of alternatives to HFCs with the preparation of the quadrennial assessment reports, he did not consider that there was an urgent need to reach a decision on the matter at the current meeting. He proposed that the timing of the periodic review be considered in 2023 when the parties would consider the next quadrennial assessment reports. That proposal met with support from another representative. The quadrennial assessment reports were usually presented to the Open-ended Working Group, and, if the timing of the two types of report were to be aligned, parties would benefit from a longer period to consider the review of alternatives to HFCs before taking it up at the Meeting of the Parties. Both representatives were of the opinion that, in order not to dilute the initial intent of decision XXVIII/2, the issue of the periodic review of alternatives to HFC should remain a stand-alone item or sub-item on meeting agendas. They also said that they looked forward to the additional, updated information on alternatives that would be provided in the quadrennial assessment report.

140. The parties agreed to defer to 2023 consideration of the alignment of future periodic reviews with the quadrennial assessment reports.

B. Status of ratification

141. Introducing the sub-item, the Co-Chair drew attention to the information set out in paragraphs 88 and 89 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), and the note by the Secretariat on the status of ratification, acceptance, accession or approval of the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP/OzL.Pro.34/INF/4) and on draft decisions for consideration by the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/3, draft decision XXXIV/[EE]).

142. The Co-Chair provided an update on the status of ratification of the Kigali Amendment as at 1 November 2022. He informed the parties that, at that date, a total of 140 parties had ratified, accepted or approved the Kigali Amendment. The representatives of Brazil and the United States, two countries that had recently become parties to the Amendment, expressed their pleasure at their countries' new status, with the representative of Brazil stating that the support of the Multilateral Fund would be crucial for his country in implementing its new obligations.

143. The parties agreed to include the updated number of parties to the Kigali Amendment in the related draft decision and to forward the draft decision for consideration and possible adoption during the high-level segment.

C. Impact of the coronavirus disease (COVID-19) pandemic on hydrofluorocarbon baselines for parties operating under paragraph 1 of Article 5 (proposal by Cuba)

144. Introducing the sub-item, the Co-Chair drew attention to the information set out in paragraphs 90 to 92 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2). He recalled that at the closing session of the forty-fourth meeting of the Open-ended Working Group, the representative of Cuba had spoken about the impact of the COVID-19 pandemic on HFC baselines for Article 5 parties and had proposed that the issue be placed on the agenda of the current meeting. Cuba had subsequently submitted a proposal for a draft decision, which had been posted on the online forum prior to the meeting.

145. The representatives of Cuba introduced the draft decision set out in a conference room paper. They explained that the pandemic had affected the majority of countries very significantly, resulting in a fall in the consumption of HFCs in 2020 and 2021. Since those were two of the three baseline years for Article 5 parties that had ratified the Kigali Amendment, the baselines would be set artificially low, which would pose challenges for countries as their consumption rose in line with the recovery from the pandemic and would probably lead to a situation of non-compliance.

146. They suggested that the parties should show flexibility towards countries thus affected, and their proposal suggested three options in that regard. Parties whose consumption levels had not been affected by the pandemic could maintain the baseline years as 2020 to 2022; parties whose consumption levels had been greatly affected could use an average of consumption for the years 2018 and 2019, plus 20 per cent; or parties whose consumption levels had been significantly affected could use the average consumption for the period 2015–2019, with the option of choosing the average of that period's three best years, plus a 20 per cent increase. In all cases the baseline would include 65 per cent of the baseline consumption of HCFCs, as set out in the Kigali Amendment.

147. Many representatives thanked Cuba for introducing the proposal and expressed their support for it. They emphasised that the pandemic had had a profound effect on many countries' economies, particularly those that were heavily dependent on tourism, with a resulting sharp fall in volumes of HFC imports in 2020 and 2021, and possibly even in 2022. One representative commented that his country had seen a reduction of 30 per cent in HFC imports, while another observed that her country's HFC consumption had been lower in 2021 than in 2020. The Montreal Protocol had a proud record of providing assistance to parties facing challenges in complying with their obligations, and this totally unprecedented event surely warranted such support.

148. One representative suggested that it would be undesirable to reopen the negotiations over the Kigali Amendment, and that other routes to provide assistance could be explored, such as support from the Multilateral Fund. Another called for an imaginative approach to the problem, including the consideration of all options, such as the possible use of exemptions.

149. Some representatives, while recognizing the need to address the problem, stressed the need for more evidence of the effects of the pandemic on HFC consumption in Article 5 parties, including the magnitude of the impacts and whether the pandemic had affected all Article 5 parties equally.

150. Some representatives also observed that the formulas for calculating baseline consumption levels were set out in the text of the Montreal Protocol, and could not, therefore, be changed through a decision of a Meeting of the Parties. This would need, instead, either an adjustment or an amendment to the Protocol which, in turn, would need to be submitted to the Secretariat six months in advance of a Meeting of the Parties. This would allow sufficient time for consideration of the issue, and could be done prior to the next Meeting of the Parties in 2023. A number of representatives raised the issue of whether an assessment and review of the control measures, as stipulated in Article 6 of the Montreal Protocol, would be necessary before an adjustment or amendment could be considered.

151. All the representatives who spoke said that they would welcome the opportunity to discuss the proposal further in greater detail.

152. The representative of Cuba thanked the parties for their comments. He stressed the unprecedented nature of the pandemic and the drastic effects it had had, not just on economic growth but on all aspects of society. Some parties had seen imports of refrigerants fall almost to zero. There

was an urgent need to adapt the Montreal Protocol to the new reality. He expressed the view that, with the first HFC compliance target coming up in 2024, parties could not wait another year to take action.

153. The Co-Chair thanked the parties for their comments and concluded that there was clearly a need for further discussion in an informal setting. Accordingly, the parties agreed to establish an informal group on the impact of the COVID-19 pandemic on HFC baselines, to be co-chaired by Ralph Brieskorn (Netherlands) and Daniel López Vicuña (Mexico).

154. Subsequently, after discussion of both the proposal and a counter proposal in the informal group, the co-chair of the group introduced a draft decision on the matter agreed by the group.

155. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XV. Safety standards (decision XXIX/11)

156. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 93 to 95 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2), paragraphs 29 to 32 of and annex III to the addendum thereto (UNEP/OzL.Pro.34/2/Add.1), and the system safety standards tool.

157. He recalled that, by decision XXIX/11, the Secretariat had been requested to develop a tabular overview of relevant safety standards that would be made available on its website and updated prior to each Meeting of the Parties. Pursuant to that decision, at the current meeting parties would consider whether to renew that request to the Secretariat.

158. In the ensuing discussion, the representative of the European Union said that the Secretariat had undertaken helpful work in keeping parties informed of safety standards, and the European Union intended to submit, for consideration by the parties, a conference room paper containing a draft decision on renewing the mandate of the Secretariat to undertake the task set out in decision XXIX/11. Another representative said that the information gathered by the Secretariat had proved useful in assisting parties to the Kigali Amendment to conduct training and establish safety standards for potentially flammable low-GWP alternatives to HFCs. Another representative, expressing support for the extension of the Secretariat's mandate, said that the knowledge-sharing work of the Secretariat had been beneficial in a rapidly evolving field where safety concerns, including flammability, might act as a barrier to the broader adoption of low-GWP alternatives.

159. Subsequently, the representative of the European Union introduced a draft decision set out in a conference room paper submitted by her party. The proposal recalled existing decisions related to safety standards; stressed the importance of ensuring safety in the market introduction, manufacturing, operation, maintenance and handling of equipment using very-low-GWP refrigerants that were alternatives to HCFCs and HFCs and the importance of being informed of progress in the updating of relevant standards; and requested the Ozone Secretariat to continue providing information on relevant safety standards, as requested in decision XXIX/11, including when notified thereof by a party or a group of parties.

160. The Co-Chair encouraged parties to consider the proposed draft decision and, in the margins of the meeting, to seek any necessary clarifications from the European Union and propose any desired modifications.

161. Subsequently, after discussions in the margins of the meeting, the representative of the European Union introduced a revised draft decision on the matter.

162. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XVI. Recognition of the achievements of Paul Jozef Crutzen, Mario José Molina and Frank Sherwood Rowland, winners of the Nobel Prize in Chemistry in 1995

163. Introducing the item, the Co-Chair drew attention to the information set out in paragraphs 96 to 100 of the note by the Secretariat on issues for discussion by and information for the attention of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/2) and the note by the Secretariat on draft decisions for consideration by the Thirty-Fourth Meeting of the Parties to the Montreal Protocol (UNEP/OzL.Pro.34/3, draft decision XXXIV/[A]).

164. He recalled that at the forty-fourth meeting of the Open-ended Working Group there had been unanimous support for the draft decision, co-sponsored by the European Union, Mexico and the United States, to honour the work of the three heroes of ozone protection, Paul Jozef Crutzen, Mario José Molina and Frank Sherwood Rowland, and he proposed that the draft decision be forwarded to the high-level segment for consideration.

165. The parties agreed to forward the draft decision for further consideration and possible adoption during the high-level segment.

XVII. Other matters

Co-option mechanism to ensure equal participation at meetings of the Executive Committee

166. Under the item, the parties considered a conference room paper setting out a draft decision submitted by Armenia on behalf of a group of Article 5 parties from Eastern Europe and Central Asia, which proposed modalities for enhancing participation by those parties in the work of the Executive Committee of the Multilateral Fund through the co-option mechanism.

167. Introducing the conference room paper, the representative of Armenia said that the draft decision proposed the provision in the budget of the secretariat of the Multilateral Fund of funding to support the participation in Executive Committee meetings of two parties from among the Article 5 parties of Eastern Europe and Central Asia through the co-opting of one of the seven seats allocated to Article 5 parties in the years in which the Article 5 parties of Eastern Europe and Central Asia did not hold a seat on the Executive Committee.

168. In the ensuing discussion there was general acknowledgement that the proposal represented a promising way forward, given the need to ensure equitable geographical representation in the Executive Committee, as set out in decision XVI/38. Several representatives spoke of the need to approach the issue in a flexible, equitable and participatory manner. A number of issues would require further discussion, however, including how the co-opting proposal would work in practice, the need to work within the procedures and modalities of the Executive Committee, and the articulation of the “region” of Eastern Europe and Central Asia, given that it was not an official United Nations region. On the matter of the articulation of the “region,” the representative of Armenia responded that the proposed draft decision retained the language of decision XVI/38 in that regard.

169. The parties agreed that the representative of Armenia would take the lead in conducting informal consultations with interested parties with a view to refining the draft decision for further consideration by the parties.

170. Subsequently, the representative of Armenia introduced a revised proposal for a draft decision, following bilateral discussions with several parties. She observed that the revision represented a refinement of the language rather than a substantive change in the original proposal.

171. Several representatives welcomed the revised proposal and thanked Armenia for showing flexibility. Some of them requested confirmation that the draft decision, if adopted, would represent the solution to the issue raised in a previous proposal by Armenia regarding changing the composition of the Executive Committee of the Multilateral Fund, and that Armenia and other parties from the Eastern Europe and Central Asia network would no longer pursue this previous proposal. In response, the representative of Armenia drew attention to the first preambular paragraph of the draft, which acknowledged that the Executive Committee comprised seven Article 5 parties and seven non-Article 5 parties. Another representative asked whether the preceding intervention meant that the representative of Armenia was satisfied with that composition moving forward, and the latter confirmed that that was the case.

172. The parties agreed to forward the draft decision for consideration and possible adoption during the high-level segment.

Part two: high-level segment (3 and 4 November 2022)

I. Opening of the high-level segment

173. The high-level segment of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol was opened at 10.10 a.m. on Thursday, 3 November 2022, by Samuel Paré (Burkina Faso), President of the Thirty-Third Meeting of the Parties.

A. Statement by the President of the Thirty-Third Meeting of the Parties to the Montreal Protocol

174. In his remarks, Mr. Paré welcomed participants, expressing his pleasure at meeting in person once again following a number of online meetings held due to pandemic-related restrictions. He noted that, in addition to items regularly on the agenda of a Meeting of the Parties, items that parties had been unable to discuss in 2020 and 2021 owing to restricted agendas had been included in the agenda of the current meeting. He noted that he had been encouraged by the preliminary work on those issues that had taken place at the forty-fourth meeting of the Open-ended Working Group and he highlighted the adoption by the Fifth Extraordinary Meeting of the Parties of a decision on the replenishment of the Multilateral Fund for the triennium 2021–2023, an issue that had been pending since 2020.

175. Highlighting the agenda item on recognizing the achievements of Paul Jozef Crutzen, Mario José Molina and Frank Sherwood Rowland, winners of the Nobel Prize in Chemistry in 1995, Mr. Paré expressed the hope that the related draft decision would receive unanimous support at the current meeting and that parties would uphold the legacy of the Nobel laureates by renewing their commitment to the work of the Vienna Convention and the Montreal Protocol.

176. Recalling the sixth anniversary of the adoption of the Kigali Amendment on 15 October 2022, he congratulated the 140 parties to the Amendment and emphasized the importance of universal ratification of the Amendment for maximum impact. Apart from protecting the climate, the replacement of HFCs would create an opportunity to increase the energy efficiency of cooling equipment and to significantly reduce energy costs for consumers and businesses. He urged the parties that had not yet done so to ratify the Amendment. In closing, he thanked his fellow Bureau members and the Ozone Secretariat for their support during his presidency.

B. Statement by a representative of the United Nations Environment Programme

177. In her opening remarks, Inger Andersen, Executive Director of UNEP, said that, on the thirty-fifth anniversary of the Montreal Protocol, it was fitting that the Meeting of the Parties be held in the city where the instrument's journey had begun. Efforts since that time had delivered invaluable benefits, protecting the planet from ultraviolet radiation and avoiding millions of cases of skin cancer and billions of dollars' worth of damage to agriculture, fisheries and other resources. Actions under the Protocol had also significantly contributed to avoiding climate change on a massive scale through the phase-out of climate-warming, ozone-depleting substances, and to protecting carbon sinks. Furthermore, the Kigali Amendment was expected to avoid global warming of up to 0.5°C through the phase-down of HFCs, which would be a huge contribution, given how far behind the global community was in decarbonizing its economies and societies. The achievement of universal ratification of the Kigali Amendment was a key issue, and she urged countries that had not yet done so to ratify and start implementing the Amendment. The adoption of more energy-efficient cooling technology to accompany the HFC phase-down was also crucial with a view to doubling the climate gains of the Kigali Amendment. Ms. Andersen noted that participants were discussing the enhancement of energy efficiency and other challenges and opportunities related to the Kigali Amendment at the current meeting.

178. Highlighting that activities under the Montreal Protocol would continue to be supported by sound science and funding, Ms. Andersen thanked the members and experts of the Scientific Assessment Panel, the Environmental Effects Assessment Panel and the Technology and Economic Assessment Panel for providing the information needed for sound policymaking. She also thanked the parties for finalizing the replenishment of the Multilateral Fund for the triennium 2021–2023, noting that funding was crucial to enabling many Article 5 parties to begin implementing the Kigali Amendment. She also wished parties well in their discussions on the terms of reference for the study on the next replenishment of the Multilateral Fund.

C. Statement by a representative of the Government of Canada

179. Cécile Siewe, Associate Assistant Deputy Minister for Environmental Protection, Department of Environment and Climate Change Canada, welcomed participants to Canada and thanked the Ozone Secretariat for organizing the Thirty-Fourth Meeting of the Parties in Montreal. She expressed gratitude to participants for their dedication in finding solutions to complex problems in order to protect both the ozone layer and the climate. The Montreal Protocol was not only the blueprint for successful global environmental cooperation but also a template for how to bring together government, industry, science and civil society to address imminent environmental threats. She then

introduced a video message by Steven Guilbeault, Canadian Minister of Environment and Climate Change.

180. In his address, Mr. Guilbeault also welcomed participants to Montreal, thanking the Ozone Secretariat for holding a Meeting of the Parties in the city for a fourth time. The Montreal Protocol was a testament to the success that could be achieved when Governments, scientists, industry and civil society collaborated to address an urgent environmental threat. The executive summary of the report *Scientific Assessment of Ozone Depletion: 2022* not only confirmed that the ozone layer was on a path to recovery thanks to the implementation of the Montreal Protocol but also highlighted that the phase-out of substances controlled under the Protocol would avoid global warming of 0.5–1 C by the mid-century. In addition to that benefit, the recovery of the ozone layer would reduce ultraviolet radiation damage to carbon sinks, which would also help to avoid global warming. Through the Kigali Amendment, the Montreal Protocol was expected to contribute further to climate protection through the phase-down of HFCs, thus preventing an increase in temperature of up to 0.5°C by 2100. That climate benefit could be increased tenfold if the energy efficiency of products and equipment were to be improved during the transition away from HFCs. Such ambitions came with challenges, however, including, in the short-term, the need for developing countries to comply with the 2024 freeze in HFC consumption. In that respect, Mr. Guilbeault said that Canada was committed to continuing to contribute financially to the Multilateral Fund and to working with international partners, including the United Nations Development Programme (UNDP), to share and promote climate-friendly alternative technologies and technical expertise to reduce the use of HFCs in developing countries. Canada itself had already achieved a reduction of 38 per cent in HFC consumption from its baseline levels, significantly surpassing its Montreal Protocol target of 10 per cent. In closing, he reiterated his Government's strong commitment to the success of the Montreal Protocol.

II. Organizational matters

A. Election of officers for the Thirty-Fourth Meeting of the Parties to the Montreal Protocol

181. At the opening session of the high-level segment of the meeting, in accordance with paragraph 1 of rule 21 of the rules of procedure, the following officers were elected, by acclamation, to the Bureau of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol:

President:	Hassan Mubarak (Bahrain) (Asia-Pacific States)
Vice-Presidents:	Jana Mašíčková (Czechia) (Eastern European States)
	Adrian Forde (Barbados) (Latin American and Caribbean States)
	Alain Wilmart (Belgium) (Western European and other States)
Rapporteur:	Cyrus Mageria (Kenya) (African States)

B. Adoption of the agenda of the high-level segment

182. The following agenda for the high-level segment was adopted on the basis of the provisional agenda set out in section II of document UNEP/OzL.Pro.34/1:

1. Opening of the high-level segment:
 - (a) Statement by the President of the Thirty-Third Meeting of the Parties to the Montreal Protocol;
 - (b) Statement by a representative of the United Nations Environment Programme;
 - (c) Statement by a representative of the Government of Canada.
2. Organizational matters:
 - (a) Election of officers for the Thirty-Fourth Meeting of the Parties to the Montreal Protocol;
 - (b) Adoption of the agenda of the high-level segment;
 - (c) Organization of work;
 - (d) Credentials of representatives.

3. Presentations by the assessment panels on progress in their work and key issues emanating from their 2022 quadrennial assessments.
4. Presentation by the Chair of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol on the work of the Executive Committee, the Multilateral Fund secretariat and the Fund's implementing agencies.
5. Statements by heads of delegation and discussion on key topics.
6. Report by the co-chairs of the preparatory segment and consideration of the decisions recommended for adoption by the Thirty-Fourth Meeting of the Parties.
7. Dates and venue for the Thirty-Fifth Meeting of the Parties to the Montreal Protocol.
8. Other matters.
9. Adoption of decisions by the Thirty-Fourth Meeting of the Parties to the Montreal Protocol.
10. Adoption of the report of the meeting.
11. Closure of the meeting.

C. Organization of work

183. The parties agreed to follow their customary procedures.

D. Credentials of representatives

184. The Bureau of the Thirty-Fourth Meeting of the Parties to the Montreal Protocol approved the credentials of the representatives of 79 of the 127 parties represented at the meeting. The Bureau provisionally approved the participation of 1 party on the understanding that it would forward its credentials to the Secretariat as soon as possible. The Bureau urged all parties attending future meetings of the parties to make their best efforts to submit credentials to the Secretariat as required under rule 18 of the rules of procedure. The Bureau further recalled that the rules of procedure required that credentials be issued either by a head of State or Government or by a minister for foreign affairs or, in the case of a regional economic integration organization, by the competent authority of that organization. The Bureau recalled that representatives of parties not presenting credentials in the correct form could be precluded from participating fully in the meetings of the parties, including with regard to the right to vote.

III. Presentations by the assessment panels on progress in their work and key issues emanating from their 2022 quadrennial assessments

185. On behalf of the Montreal Protocol's three assessment panels, Bonfils Safari, John Pyle and Paul Newman, co-chairs of the Scientific Assessment Panel, Janet Bornman, co-chair of the Environmental Effects Assessment Panel, and Bella Maranion, co-chair of the Technology and Economic Assessment Panel, delivered presentations on the work of the panels in preparing the 2022 quadrennial assessments. Summaries of the presentations are set out in section C of annex I to the present report.

186. Responding to questions about potential additions to the report of the Scientific Assessment Panel, Mr. Pyle clarified that the document had already been finalized, and was now in production, so no further additions were feasible, although it would always be possible to provide updates on specific issues. A paper on regional emissions of methyl bromide, mentioned by the questioner, had not been reviewed for the report because it had been published too recently.

187. Responding to further questions, Mr. Newman observed that iodine was a very powerful ozone-depleting agent, and was therefore carefully monitored, but so far it was present in the stratosphere only in small concentrations. Top-down estimates of concentrations of carbon tetrachloride were reasonably accurate at the global level, but more monitoring stations would be needed for more precise regional estimates; he acknowledged the finance recently made available by the European Union for monitoring stations.

188. On the impact of volcanoes and wildfires, Mr Newman commented that the eruption of the Hunga Tonga-Hunga Ha'apai volcano in December 2021 had injected a huge volume of water into the stratosphere, which was gradually spreading throughout the Southern hemisphere and beginning to

leak into the Northern hemisphere too. This was expected to increase the extent of the Antarctic ozone hole in 2023, although the impact would have been much lower in the absence of anthropogenic chlorine. David Fahey, co-chair of the Scientific Assessment Panel, added that the scientific community had been fortunate in being able to benefit from measurements taken from balloon instruments launched directly into the volcanic plume soon after the eruption, which had greatly assisted their understanding of the impact; since eruptions were unpredictable, this was not always possible. Wildfires also injected large volumes of material into the stratosphere, although of different types; the very extensive fires in Australia in 2019 had resulted in a very intense plume which had affected the chemistry of the stratosphere, but only for a relatively short period.

189. Responding to a question about very short-lived chlorine-containing substances, Mr. Pyle explained that it was impossible to make accurate future predictions. While increased emissions of dichloromethane had now been observed for more than 10 years, their sources were not fully understood, but it seemed likely to be a mix of natural and artificial origins. Similarly, the very large increase in HFC-23 emissions was not fully understood, but was assumed to be largely from feedstock. In response to a question about other fluorinated substances, such as sulphur hexafluoride, Mr. Pyle drew attention to the annex that would accompany the report of the Scientific Assessment Panel, which would include a vast amount of information on that and many other substances.

190. Ms. Maranion added that the panels collaborated closely on their assessment reports. The Technology and Economic Assessment Panel was currently updating its bottom-up estimates of emissions of carbon tetrachloride. Responding to a question on sources of halon emissions, Adam Chattaway, co-chair of the Halons Technical Options Committee, stated that the committee thought that emissions of halon 1301 were mostly from feedstock, while emissions of halon 2402 were probably mainly from the decommissioning of old equipment. In each case further information would be welcome.

191. The President thanked the co-chairs of the assessment panels for their presentation and all the panel members for the assessment work they had been carrying out and for all their efforts to aid in the protection of the ozone layer. He said that the co-chairs and members of the panels would be present at the meeting until its conclusion and he encouraged participants to take advantage of their presence to follow up on any questions directly with them.

192. The parties took note of the information presented.

IV. Presentation by the Chair of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol on the work of the Executive Committee, the Multilateral Fund secretariat and the Fund's implementing agencies

193. Mr. Hassan Mubarak, Chair of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, reported on the work of the Executive Committee, the Multilateral Fund secretariat and the implementing agencies of the Fund since the Thirty-Third Meeting of the Parties, summarizing the information set out in document UNEP/OzL.Pro.34/7. His statement is set out in annex II to the present report.

194. The parties took note of the information presented.

V. Statements by heads of delegation and discussion on key topics

195. Under the agenda item, the parties, in addition to hearing statements by heads of delegation and their representatives, engaged in a 90-minute round-table discussion.

A. Statements by heads of delegation

196. During the high-level segment, statements were made by the heads of delegation or their representatives of the following parties: Angola, Bahamas, Barbados, Brazil, Burundi, Cambodia, Canada, China, Cuba, Eswatini, European Union, Grenada, Indonesia, Malaysia, Mongolia, Myanmar, Nepal, Philippines, Samoa, Saudi Arabia, South Africa, State of Palestine, Tunisia, Türkiye, Turkmenistan, United Republic of Tanzania, Viet Nam and Zambia. A statement was also delivered by the representative of the International Institute of Refrigeration.

197. Many of the representatives who spoke expressed their gratitude to the Government and the people of Canada for their hospitality. Appreciation was also extended to the Ozone Secretariat and the Bureau, the Secretariat and Executive Committee of the Multilateral Fund, UNEP, the

implementing agencies, donor partners, the assessment panels, international organizations, and other stakeholders for their role in ensuring the success of the current meeting in particular and of the Montreal Protocol in general. Several speakers expressed their satisfaction at being able to meet again in person after several years of online meetings due the COVID-19 pandemic.

198. Many representatives expressed their sincere gratitude to Mr. Bankobeza, the outgoing Senior Legal Officer, for his significant contribution to country activities to protect the ozone layer and for 30 years of dedicated service to the parties, to the Montreal Protocol and more broadly to environmental protection.

199. Many representatives paid tribute to the success of the Montreal Protocol and to the parties in controlling and phasing out ozone-depleting substances and assisting the recovery of the ozone layer, thereby contributing enormously to the safety and well-being of humanity, and asserted their continued commitment to supporting the goals of the Protocol. The thirty-fifth anniversary of the adoption of the Protocol in 1987 represented an opportunity to reflect on the critical achievements of the Protocol and what needed to be done in the future to ensure the continued protection and restoration of the ozone layer. In keeping with the theme of World Ozone Day 2022, “Global cooperation protecting life on earth”, one representative stated that the Montreal Protocol offered unequivocal proof of the potential for international cooperation to protect the environment, while another said that the instrument had demonstrated, in its vision to contribute to reducing the impact of climate change, the ability to adapt to the new challenges facing the planet.

200. A number of factors contributing to that success were alluded to, including the strong commitment of all the institutions involved, the mutual understanding between governments, businesses, industry, and civil society organizations, and the scientific work that formed the basis of activities under the Protocol. In that regard it was timely to pay homage to the work of the Nobel laureates whose research had initially drawn attention to the threat to the ozone layer, namely Mario Molina, Frank Sherwood Rowland and Paul Crutzen. In addition, the admirable level of compliance of parties with their obligations under the Protocol demonstrated a robust alignment of objectives.

201. Many representatives described the continuing actions being taken in their own countries, with assistance from the Multilateral Fund and the implementing agencies, to phase out ozone-depleting substances, implement the various stages of their HCFC management plans and achieve compliance with the provisions of the Protocol, including through legislative, policy, institutional and programmatic measures. A wide range of activities were outlined, including the development of national programmes to eliminate ozone-depleting substances and convert existing technologies to more environment- and climate-friendly alternatives; legislative and regulatory action to control ozone-depleting substances within the wider environmental framework; the strengthening of institutions engaged in work related to the Montreal Protocol; the reinforcement of legal and policy frameworks; the introduction of import controls, monitoring mechanisms, and quota and licensing systems to combat illegal trade; effective action by and involvement of national ozone units in policy and programme development; strategic implementation of investment and non-investment projects; intersectoral collaboration involving a range of stakeholders, including through public-private partnership ventures; training and capacity-building for customs officers, and for service technicians in the refrigeration and air-conditioning sectors; the phase-out of methyl bromide, HCFC-141b and other potent ozone-depleting chemicals; the promotion of alternative substances and new technologies, particularly in the refrigeration, air-conditioning and foam sectors, with a focus on climate benefit and energy efficiency; educational and awareness-raising campaigns, including in the area of safety; and the use of electronic and online technologies to facilitate monitoring, enforcement and compliance.

202. With regard to the Kigali Amendment, many representatives said that they had now ratified the Amendment, recognizing its significance for the future direction of the Montreal Protocol and its critical role in global efforts to combat climate change through reduced greenhouse gas emissions. There was widespread acknowledgement by parties of the urgent need to undertake action to phase down the consumption and production of HFCs. The successful implementation of the Kigali Amendment could prevent a temperature increase of 0.4°C and associated energy efficiency improvements could greatly enhance climate benefits, making a substantial contribution to attaining the goal of the Paris Agreement. One representative said that the Kigali Amendment represented a path of great responsibility but also of great opportunity to modernize national industry, to promote the 2030 Agenda for Sustainable Development and its goals, and to combat climate change. Another observed that the success of the Montreal Protocol in protecting the environment, and its continued reputation as the most effective multilateral environmental agreement, would depend on how successful it was in implementing the phase-down of HFCs at the global level. Another representative highlighted the need to introduce HFC-related projects within a national environmental strategy that

adopted best international practices and was based on scientific foundations to protect human health and the environment while ensuring the sustainability of the activities undertaken.

203. A number of representatives described the national actions already being carried out to implement the Kigali Amendment and to introduce climate-friendly technologies, including demonstration projects for the conversion of manufacturing lines to environmentally friendly alternatives; data gathering on the current status of use of HFCs to support policy formulation; legislative measures, including regulating the import and disposal of HFCs; the inclusion of Kigali Amendment-related actions within wider environment and climate protection programmes, plans and strategies; establishing licensing systems; establishing facilities for the recovery and recycling of refrigerant and air-conditioning fluids; awareness-raising activities among relevant stakeholders; gap analysis to assess future needs in relation to the current market situation, and develop an action plan to bridge the gap; public procurement policies to promote alternative technologies in the public sector; improved data collection systems to facilitate monitoring and control mechanisms and regulate trade; the establishment of energy efficiency labelling standards and minimum energy performance standards for refrigeration and air-conditioning appliances; conducting multistakeholder seminars and workshops with the participation of national and international consultants; and the inauguration of a centre of excellence and regional training hub for capacity development in natural refrigerant technology.

204. There were, however, a number of challenges to the successful implementation of the Kigali Amendment. The transition to more energy-efficient equipment associated with the adoption of low-GWP technologies entailed adjustments to energy sectors and the overall economy that could prove testing for low-income countries. The current high cost of several alternative technologies currently available, especially in the refrigeration sector, heightened that challenge. New technologies, including the use of natural refrigerants with low GWP, required comprehensive theoretical and practical training of workers in the sector, with considerable financial implications. Recovery, regeneration and recycling were additional activities requiring financial and capacity support. Finally, safety standards related to flammability, toxicity and high pressure of alternative refrigerants could constitute a barrier to adoption.

205. Nevertheless, a number of representatives outlined innovative ways in which their countries were prioritizing action to promote energy efficiency and achieve socioeconomic and environment co-benefits, including through vocational training of a new cadre of specialists and the adoption of an interlinked, integrated approach combining HFC phase-down, technological development for low-GWP substances, and increased energy efficiency in the refrigeration and air-conditioning sectors. Cooperation between parties could assist in developing country-specific strategies that were practical and cost-effective. Shared data on trade, sources of technology, storage and the disposal of unwanted ozone-depleting substances would enable the global community to tailor approaches to situational needs. The representative of the International Institute of Refrigeration outlined recent developments in the refrigeration sector, specifically the cold chain for food and health products, with significant potential benefits for the well-being of humankind and the environment. One representative, speaking on behalf of a group of countries, said that opportunities should be taken to explore synergies between international environmental treaties and bodies and other relevant organizations and institutions to enhance energy efficiency and increase the impact of the work in phasing down HFCs.

206. More generally, burgeoning global challenges continued to have an impact on the work of the Montreal Protocol, requiring an agile, responsive and flexible approach. The COVID-19 pandemic had slowed economic growth in many sectors and jeopardized the ability of countries to fund projects. That in turn had led to a drop in the consumption of HCFCs and HFCs that might necessitate a reconsideration of national baselines. Small island developing States remained highly vulnerable to the impacts of ozone layer depletion and climate change, requiring further elucidation of the concept of climate justice and enhanced global cooperation to protect life on Earth. Conflict, also, continued to have severe negative impacts on human and environmental health, as illustrated by the current conflicts involving the Russian Federation and Ukraine, and Israel and the State of Palestine.

207. A further conundrum was presented by unexpected emissions of certain substances, for example trichlorofluoromethane (CFC-11) and methyl bromide, requiring action to identify gaps in the global coverage of atmospheric monitoring and put in place measures to enhance monitoring. One representative summarized the most recent scientific innovations that were being undertaken to monitor the ozone layer using a suite of high-resolution ground- and balloon-based instruments. One representative, speaking on behalf of a group of countries, said that it was vital that parties worked together to tackle the illegal production and trade in CFCs and other controlled substances, and to share information on such matters as carbon tetrachloride production and its links to CFC-11. It was

necessary to learn from those experiences in order to react quickly and decisively when similar events occurred in the future.

208. A number of representatives highlighted the role of financial and other support in enabling parties to comply with their obligations under the Montreal Protocol. The significant assistance offered by the Multilateral Fund and the implementing agencies was widely acknowledged. However, a number of representatives commented on the need for a reliable, sufficient flow of technical and financial assistance in order for parties to comply with their commitments under the Montreal Protocol, including the Kigali Amendment. One representative said that support in the areas of technical and knowledge solutions, developing competencies, transferring knowledge and localizing technology was fundamental to achieving environmental and economic sustainability, and constructive cooperation in providing such support was vital to the successful implementation of the Protocol and its amendments. Several representatives identified areas where funding would be particularly beneficial, including the generation of data on the performance of alternative technologies; addressing barriers to adoption due to limited availability of and access to ozone-friendly, low-GWP, energy-efficient technologies that were regionally appropriate; the destruction of stockpiles of refrigerants and other controlled substances; the introduction of customs data management systems to ensure accurate data reporting; and enhancing the knowledge of ozone officers and related stakeholders on new technologies and safety standards. Such activities could be specifically considered during the next replenishment of the Multilateral Fund for the period 2024–2026.

209. There was general acknowledgement of the role of partnership and collaboration in achieving environmental and human well-being objectives, including those of the Montreal Protocol. One representative, speaking on behalf of a group of countries, said that multilateral cooperation, based on mutual respect, was crucial to addressing the huge environmental challenges facing humanity. Another representative said that international environmental treaties were an effective means of protecting the planet and its environment if based on objective scientific proposals, parallel and fair support, and the avoidance of politicization outside the competence of agreements.

210. A number of representatives placed the actions to protect the ozone layer under the Montreal Protocol within the wider context of efforts to protect human health and the environment and to promote sustainable development. Some representatives alluded to the green economy as an appropriate framework in which to undertake activities relevant to the Montreal Protocol. One representative mentioned gender equality as a crucial component of inclusive efforts to achieve balanced growth and participatory decision-making.

211. Several representatives offered their thoughts on the way forward for the Montreal Protocol. One representative urged the Montreal Protocol community to avoid complacency and ensure that sufficient monitoring and enforcement measures were in place to dissipate any actions that might threaten the work already completed and slow down the recovery of the ozone layer. In that regard, it was essential to raise awareness among the international community of the significant benefits that could accrue from the implementation of the Kigali Amendment. Other desirable aims included continued capacity-building and technical assistance for developing countries, and providing training and strengthening of national capacity on issues related to energy efficiency, including through the development of pilot programmes. One representative, speaking on behalf of a group of countries, said that an essential element for the ongoing success of the Protocol was the implementation of new industrial standards enabling the uptake of innovative and natural refrigerants and encouraging the development of new ones where needed.

212. In conclusion, there was general optimism that the significant work undertaken thus far under the Montreal Protocol constituted a powerful foundation for continuing efforts to protect the ozone layer, combat climate change, and ultimately protect the environment of planet Earth for the benefit of present and future generations.

B. Round-table discussion on the Kigali Amendment and its potential impact on climate

213. The round-table discussion was moderated by Mona Nemer, Chief Science Adviser to Canada's Prime Minister, Minister of Innovation, Science and Industry, and Cabinet. The panellists were Kerryne James, Minister for Climate Resilience, Environment, and Renewable Energy, Grenada; Abdulla Naseer, Minister of State for Environment, Climate Change and Technology, Maldives; Jan Dusík, Deputy Minister for Climate Protection, Czechia; Cécile Siewe, Associate Assistant Deputy Minister, Environmental Protection, Environment and Climate Change Canada; Klaus Peter Schmid Spilker, President of the Chilean Chamber of Refrigeration and Air-Conditioning; Dawda Badgie,

Executive Director of the Environmental Protection Agency, Gambia; and Kylie Farrelley, General Manager of Refrigerant Reclaim Australia.

214. Ms. Nemer welcomed participants to Montreal and to the discussion on the Montreal Protocol's legacy of success, which she described as an illustration of the greatness that could ensue when scientists and policymakers worked together. Now celebrating its thirty-fifth anniversary, the implementation of the Montreal Protocol had led to the phase-out of 99 per cent of ozone-depleting substances, most of which were also highly potent greenhouse gases. It had also protected the vegetation that acted as a carbon sink, adding to the Protocol's significant contribution to climate change mitigation. The Kigali Amendment, which had come into effect in January 2019, had brought HFCs under the control of the Montreal Protocol and was expected to lead to the avoidance of up to 0.5°C of global warming by the end of the century, a figure that could potentially double if the HFC phase-down incorporated energy efficiency improvements in the cooling sector. The cooling sector was becoming increasingly important in a warming world, with energy demand forecast to triple by mid-century owing to the growing use of air conditioning. If the rate of energy consumption continued unabated and the current cooling system refrigerants did not switch to ozone- and climate-friendlier alternatives, the sector would contribute to global warming that could surpass the 1.5°C target of the Paris Agreement by 2030.

215. Ms. Nemer then proceeded to lead the discussion on the legacy of the Montreal Protocol and ways to maximize the positive impact of the implementation of the Kigali Amendment on the climate and sustainable development. The discussion took the form of four rounds of questions, with answers from the panellists and additional questions and comments from representatives.

1. First round

216. Ms. Nemer directed her first question to Ms. Siewe and Mr. Jan Dusík, asking them how parties could deliver on the drastic greenhouse gas emission reductions required to meet the Paris Agreement target of limiting warming to 1.5°C, including reductions in emissions from the HFCs to be phased down under the Kigali Amendment.

217. Ms. Siewe responded that it was important to effectively communicate what the Montreal Protocol had been able to achieve in the last 35 years. Talking about a 99 per cent reduction in ozone-depleting substances made it sound as though the Protocol had achieved its goal, but people should be made aware of its potential to prevent 0.5–1°C of warming, a significant contribution to limiting warming to 1.5°C, or even 2–3°C. Raising the Protocol's profile and enhancing the understanding and appreciation of its potential would lead more countries and parties to sign on to the various agreements, generate more resources for the work required to accelerate the development of lower-GWP technologies and products, and help countries to go beyond the strict compliance schedules of the Kigali Amendment and achieve greater HFC reductions. More resources and attention would also support the proper recovery and disposal of stocks of substances in older equipment, which, while not a compliance issue as such under the Protocol, also had the potential to contribute substantially to protecting the climate; in that regard, she welcomed the Executive Committee's recent decision to provide assistance for the development of disposal strategies and to consider a funding window for disposal pilot projects.

218. Mr. Jan Dusík recommended taking a holistic perspective to see how the Montreal Protocol could be integrated into the spectrum of instruments that had the potential to combat climate change in a way that created options for cooperation that could improve synergies between environmental instruments. The Kigali Amendment could serve as a bridge in that sense, being an important tool for avoiding the use of HFCs to replace the ozone-depleting substances being phased out. Progress in the ratification of the Kigali Amendment, the implementation of the Amendment at the national level and enforcement of the Montreal Protocol would demonstrate that the Protocol could continue to lead in the environmental arena and also be effective in addressing climate change. There were of course challenges, as well as a need for the right reporting, control measures, monitoring that addressed all aspects of life cycle – production, trade, use and emissions – and cooperation across borders. The European Union, which was putting in place a fluorinated greenhouse gases regulation that provided for HFC reduction with a quota system and bans for specific uses, could act as a role model, providing proof that high ambition and high bars could be reached.

219. Two representatives also took the floor to address the question, highlighting the importance of the Kigali Amendment in the fight against climate change. They mentioned a number of elements that they considered key to the realization of the Kigali Amendment's potential, including reliance on science; assistance for Article 5 parties through adequate, timely and predictable funding for the transition to HFC alternatives, capacity-building, readiness projects and institutional strengthening

activities; support for regional ozone networks; refrigerant recovery, reclamation and disposal; and the development of national cooling action plans, which would lead to the promotion of passive cooling measures, energy efficiency, green procurement and enhancement of refrigeration and air conditioning service technician servicing practices.

2. Second round

220. In the second round, Ms. Nemer asked Mr. Naseer, Mr. Badgie and Ms. James about their experiences with their countries' HFC phase-down processes and the associated challenges, and what domestic and international actions they felt were needed to overcome those challenges.

221. Mr. Badgie reported that in its HCFC phase-out and HFC phase-down efforts, the Gambia had found it very effective to engage a broad range of stakeholders across all sectors in order to achieve its aims. The country also provided training for customs officials and technicians, had created associations for them and provided them with financial support. The fishing and foam sectors in the Gambia had many facilities that used HFCs and therefore received special attention. The challenges encountered were mainly financial, as transformation to ozone-friendly substances was an expensive undertaking; hence, more financial support was required.

222. Mr. Naseer said that the HFC phase-down efforts of Maldives, a low-lying State that was highly vulnerable to the impact of climate change, were strongly motivated by the knowledge that the successful implementation of the Kigali Amendment would produce the dual benefit of protecting the ozone layer and mitigating climate change. In June 2022, the country had achieved an important milestone, concluding its implementation of the Kigali enabling activities initiated in November 2017. In Maldives, air conditioning was a key sector, with locally used air conditioners currently accounting for 68 per cent of equipment imports and demand expected to grow as the climate warmed. The introduction of low-GWP alternatives in the air-conditioning sector was therefore particularly important. The country faced challenges, however, related to access to alternative technologies and insufficient resources and capacity. In closing, Mr. Naseer added that for the Montreal Protocol to remain a success story over the next 35 years and beyond, parties would need to continue to broaden their goals for the Protocol.

223. Reporting on Grenada's efforts to implement the Kigali Amendment, Ms. James said that the country had been the thirty-seventh party to ratify the Amendment, attesting to the Government's commitment to efforts under the Montreal Protocol. The country had taken a number of steps to broaden its legislative and policy framework, including establishing national industry standards for the refrigeration and air-conditioning sector and preparing its national cooling action plan for reducing direct and indirect greenhouse gas emissions. The cooling action plan was very similar to the nationally determined contribution, which included the goal of reducing emissions by 40 per cent by 2030. As a small country, however, Grenada was limited in what it could do. Its domestic challenges included finding sufficient funding to implement the Kigali Amendment, strengthening control measures, particularly at the border, and increasing capacity and establishing a certification scheme for refrigeration and air-conditioning technicians.

224. Several representatives also commented on the challenges facing their countries in implementing the Kigali Amendment, citing the need for access to alternative technologies, including a call to the scientific community for more efforts to develop alternatives; additional funding, in particular for small island developing States and other small countries that were unable to benefit from economies of scale; training for service sector technicians; technical capacity-building and equipment for customs officials to enable control of imported gases; implementation of a quota and licensing system; addressing of risks associated with handling of hydrocarbons; strengthening of refrigerant recovery and recycling; development of standards for the certification of refrigeration and air-conditioning technicians; and more sharing of HFC phase-down success stories.

225. One representative called for a holistic approach that included reducing dependence on fossil fuels by ensuring that equipment used not only low-GWP alternatives but also power from renewable sources.

3. Third round

226. Recalling that the Kigali Amendment promised to prevent up to 0.5°C of global warming by 2100, an impact that could be amplified if the HFC phase-down were accompanied by energy efficiency enhancements, Ms. Nemer asked how Australia, Czechia and by extension the European Union, Chile and Grenada planned to address the energy aspect of the phase-down, as well as what business opportunities there were for the private sector and how they could be seized.

227. Mr. Jan Dusik began by sharing information on the European Green Deal, which included instruments aimed at reducing fluorinated greenhouse gases, including HFCs, across the European Union. The issues were complex and required complex solutions. Thus, for instance, the energy efficiency directive within the European Green Deal provided for assessments and planning for regional, national and local heating and cooling and the promotion of better heating and cooling efficiency, including the accelerated replacement of old and inefficient heating systems, phasing out of fossil fuel systems overall and an increase in the use of renewable energy in heating and cooling. There were opportunities for the business sector in connection with heating and cooling in building construction and renovation and the introduction of new technologies in support of low emissions, looking at the whole life cycle of the carbon footprint and identifying energy-saving measures. Such efforts were increasingly popular, particularly in the context of the current energy crisis and the impact of the Russian Federation's aggression in Ukraine.

228. In her comments, Ms. Farrelly supported taking a holistic view when developing policy for the HFC phase-down. Taking the example of reclamation, which might at first glance seem desirable, she cautioned that the Australian experience with the HCFC phase-out had revealed that reclamation had the effect of extending the life of old, inefficient equipment. Leakage also became a significant consideration. In the context of the HFC phase-down, particularly when high-global-warming-potential products were installed in equipment, the negative impact of reclamation on equipment energy efficiency and emissions was an important element to consider.

229. Mr. Schmidt acknowledged that Europe provided a good example but said that his country faced a different reality in that it was dealing with equipment that had to be replaced. His organization enjoyed a good partnership with the ozone units and was implementing projects and solutions, controlling leakage, providing training in good practices and partnering with the national energy efficiency agency. Fortunately, Chile had good sources of solar and wind energy and could thus move away from fossil fuels for energy generation, although it was currently experiencing transmission issues. In his view, however, refrigerant inventory control was key to HFC phase-down efforts.

230. Ms. James said that her Government, recognizing that improvements in energy efficiency of refrigeration and air-conditioning equipment could result in a significant reduction in greenhouse gas emissions, had moved swiftly to establish minimum energy performance standards, and had included energy efficiency in the cooling sector in the country's second nationally determined contribution. Energy efficiency was also covered in the national energy policy and the national sustainable development plan for the period 2020–2035. The Government had established a ministerial portfolio that included renewable energy, thereby demonstrating its political commitment and support for the energy sector and its understanding of the need for a mixed energy portfolio. She highlighted the need for a mix of financial resources that prioritized grant resources over loans, saying that while the country had the will to meet its obligations it lacked the fiscal space to take on additional debt. In terms of business opportunities for the private sector, the Government created an enabling environment by setting policy and providing incentives but expected private industry to be the driving force in achieving the targets under the Montreal Protocol. Thus, servicing companies and importers of air-conditioning equipment were expected to lead the way in introducing new climate-friendly energy-efficient technologies to the market. In her view, cooling as a service was a business opportunity where servicing companies made investment in the cooling equipment for the clients and were paid through the energy savings generated.

231. Mr. Badgie added that in the Gambia, addressing climate change was a matter of survival. It was clear that climate change was having an impact on all aspects of the country's livelihoods. Consequently, the Government had taken measures that included ratifying the Kigali Amendment and preparing its first and second nationally determined contributions, and identifying the sectors of key importance. Energy was one such sector. The Government aimed to develop renewable energy and had created incentives to that end. Projects with climate mitigating impacts were given priority in environmental permitting, and received financial concessions. Hydropower facilities would soon come online to replace thermal power production. The country had also established a climate-smart agricultural system and was developing integrated waste management. The Gambia was generally regarded as the country taking the most significant steps towards meeting its commitments under the Paris Agreement.

232. One representative said that in his experience, the process of developing a national cooling plan was complex but provided an excellent opportunity to engage stakeholders, explain the relevant activities to them and thus to raise their awareness of what was being done and what was needed. He therefore urged all parties to the Montreal Protocol to prepare and implement their national cooling plans as a means of communicating the achievements and the potential of the Montreal Protocol.

4. Fourth round

233. Ms. Nemer directed her fourth and final question to Mr. Naseer, Ms. Farrelley, Ms. Siewe and Mr. Schmidt. Noting that the private sector and businesses could be at the forefront of climate action thanks to their potential for innovation, replication and acting at scale, she asked the panellists what made the partnership between Government and industry successful in the implementation of the Montreal Protocol and how the private sector could be helped to fulfil or increase its potential for action under the Kigali Amendment.

234. Mr. Naseer said that the Montreal Protocol would not have achieved what it had without the private sector. His Government had identified two industries that were major users of refrigeration equipment – fisheries and tourism – and had worked very closely with them. It was important to ensure that the right incentives, such as technical help, financial incentives and capacity-building, were in place to encourage industry to collaborate. Given the current high prices of zero- and low-GWP refrigerants and equipment, it was difficult for consumers and companies to adopt the technologies. It was therefore important to ensure that new refrigerants and technologies were readily available in the market and that tax incentives were available to reduce their cost.

235. Ms. Farrelley said that good ideas could come either from Governments or from industry, but a good policy was more effective when all stakeholders were involved in its design.

236. Ms. Siewe said that one of ways in which a Government could support industry was by providing policy and regulatory certainty. The Montreal Protocol provided a vision and clear signals to the relevant industries as to how those industries needed to develop, while allowing them sufficient time to adjust. Governments could also encourage the private sector to develop and commercialize further low-GWP alternative technologies through the effective design of legislation to comply with the Kigali Amendment. She also said that the greater the number of Governments that put in place limits on the use of HFCs in products, where possible aligning themselves with one another, the clearer the signal to the private sector that by a certain deadline it would be essential to ensure sufficient production of alternative substances and the availability of alternative technologies.

237. Mr. Schmidt said that the success of the partnerships created under the Montreal Protocol lay in their cross-cutting nature. He gave the examples of the design of laws, standards, education programmes and pilot projects, which were designed to seek solutions to specific problems. The continuation of public–private cooperation was essential.

238. Two representatives made statements in response to the question. One spoke of the vital nature of engagement and close cooperation with relevant stakeholders. His Government was grateful for the support of the Multilateral Fund, which had enabled it to engage early and carry out various consultations and technology-transfer and awareness-raising programmes with the involvement of industry. Partnerships and mutual efforts and understanding between Governments and industry were key to obtaining accurate data input and formulating the most effective action plans and strategies for implementing the Protocol. The other representative highlighted the need not only for the transfer of technical skills but also for building more general awareness and knowledge. He proposed harnessing the power of social media to spread knowledge quickly.

239. A third representative asked the panellists whether any of the lessons learned during the implementation of projects under the Montreal Protocol could be applied to tackling other global environmental issues such as climate change. Mr. Dusik said that Governments working with the private sector to find solutions that gave predictability was a source of inspiration that needed to be shared. He also recalled that there was increasing demand for solutions and services that were non-polluting and did not harm the environment from service users and the public. Ms. Siewe stressed the need for communication and for showing the impact that the Montreal Protocol and the Kigali Amendment could have on addressing the global threats of climate change and biodiversity loss. She said that she was interested in the idea of engaging influencers and was sure that innovation was essential in the domain of communication too. Mr. Naseer was adamant that working together was the key to success, while Mr. Badgie expressed the view that the solution was mainstreaming the issues and potential solutions in easy-to-understand language and doing so right down to the grass-roots level.

5. Closure of the round-table discussion

240. In closing, Ms. Nemer thanked the panellists, noting that they had shown a clear policy direction with regard to addressing the implementation of the Kigali Amendment and related challenges. She said that she was energized by the continued desire for dialogue, collaboration, science, technology and innovation. New opportunities were brought about by new generations, and

she highlighted the opportunity in economies to build back better. The panellists had identified a suite of policy measures and actions that were at the parties' disposal for use in implementing the Kigali Amendment to ensure that the growing demand for cooling could be met in a sustainable manner by promoting zero- or low-GWP refrigerants and improvements to the energy efficiency of cooling systems and equipment, harnessing synergies and using renewable and green energy.

VI. Report by the co-chairs of the preparatory segment and consideration of the decisions recommended for adoption by the Thirty-Fourth Meeting of the Parties

241. The Co-Chair of the preparatory segment reported that the work of the segment had been concluded successfully, and that draft decisions had been approved for consideration and possible adoption during the high-level segment on the following topics: revised budget for 2022; budgets and contributions of the Trust Fund for the Montreal Protocol for 2023 and 2024; illegal imports of refrigeration, air-conditioning and heat pump products and equipment, and institutional processes to strengthen the effective implementation and enforcement of the Montreal Protocol, including with respect to HFC-23 and combating illegal trade; ongoing emissions of carbon tetrachloride; critical-use exemptions for methyl bromide for 2023 and 2024; stocks and quarantine and pre-shipment uses of methyl bromide; strengthening the Technology and Economic Assessment Panel and its technical options committees for the phase-down of HFCs and other future challenges related to the Montreal Protocol and the climate; nominations by parties of experts to the Technology and Economic Assessment Panel; the impact of the COVID-19 pandemic on HFC baselines for Article 5 parties; updating information on safety standards; recognition of the achievements of Paul Jozef Crutzen, Mario José Molina and Frank Sherwood Rowland; enhancing participation in the work of the Executive Committee of the Multilateral Fund; decisions on compliance-related matters recommended by the Implementation Committee; the status of ratification of the Kigali Amendment; and the membership of the Montreal Protocol bodies.

242. The parties had further approved draft decisions for consideration and possible adoption during the high-level segment on a series of challenging topics: the terms of reference for the study on the replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the triennium 2024–2026; enabling access to energy-efficient and low-GWP technologies; and gaps in the global coverage of atmospheric monitoring of controlled substances and options for enhancing such monitoring.

243. In closing, he thanked all those involved for their hard work and for the spirit of cooperation that had characterized the negotiations. This represented a fitting tribute to the Montreal Protocol on its thirty-fifth anniversary and helped to explain why the Protocol continued to be one of the most successful multilateral environmental agreements. He also thanked the secretariat for their brilliant work in support of the Parties.

VII. Dates and venue for the Thirty-Fifth Meeting of the Parties to the Montreal Protocol

244. Introducing the item, Ms. Seki recalled that the dates of the Thirty-Fifth Meeting of the Parties, which would be held from 23 to 27 October 2023, had been announced three years previously and that that information had been available on the website of the Ozone Secretariat since that time.

245. With regard to the venue, the Ozone Secretariat had made a booking at the United Nations conference facilities in Bangkok and Nairobi, having explored other United Nations venues without success for the chosen dates. Ms. Seki explained the forty-fifth meeting of the Open-ended Working Group would also be held either in Bangkok or Nairobi, from 3 to 7 July 2023. The Ozone Secretariat would communicate, through its website, early in 2023 which meeting would be held in Bangkok and which would be held in Nairobi.

246. Subsequently, the parties adopted a decision on the matter.

VIII. Other matters

247. No other matters were considered during the high-level segment.

IX. Adoption of decisions by the Thirty-Fourth Meeting of the Parties to the Montreal Protocol

248. The Thirty-Fourth Meeting of the Parties adopted the decisions approved during the preparatory segment. The decisions are available in document UNEP/OzL.Pro.34/9/Add.1.

X. Adoption of the report of the meeting

249. The parties adopted the present report on Saturday, 5 November 2022, on the basis of the draft report that had been circulated.

250. At the time of the adoption of the report, two representatives, each of whom spoke on behalf of a group of parties, requested that the parts of their statements, delivered during the current meeting, pertaining to the situation in Ukraine, be reflected in detail in the present report. Their statements are reproduced in annex III to the present report, without formal editing.

XI. Closure of the meeting

251. Ms. Seki, Executive Secretary of the Ozone Secretariat, expressed her appreciation of the role that Martin Sirois (Canada), who was retiring, had played in the implementation of the Montreal Protocol. His leadership, knowledge and experience, both as a delegate and co-chair of the Open-ended Working Group meetings and numerous contact groups, had been key in identifying sensible solutions and compromises, while his sense of humour had contributed to a convivial atmosphere in meetings, for which he would be remembered and missed. Several representatives joined her in recalling his skilled co-chairing of the Open-ended Working Group and various groups, which had contributed significantly to the success of the meetings and the Protocol itself. They expressed their best wishes for his retirement, and stated that they would greatly miss him, along with Mr. Bankobeza, Senior Legal Officer of the Secretariat, to whom many representatives had paid tribute during the course of the meeting. Ms. Seki also paid tribute to Mr. Ole-Kristian (Norway), who was leaving the ozone family for a new post working on climate change.

252. Following the customary exchange of courtesies, the meeting was declared closed at 1.05 a.m. on Saturday, 5 November 2022.

Annex I

Summaries of presentations by members of the assessment panels and technical options committees*

A. Presentation of the Methyl Bromide Technical Options Committee of the Technology and Economic Assessment panel on the 2022 critical-use nominations for methyl bromide

1. On behalf of TEAP, the Methyl Bromide Technical Options Committee co-chairs, Marta Pizano and Ian Porter presented the final recommendations for the 2022 critical use nomination requests for methyl bromide.
2. Ms Pizano showed that only three parties continue to apply for CUNs. Of the total amount nominated of 39.507 t in this round, MBTOC has recommended 22.857 t for the nominations from Canada (3.857 t) and Republic of South Africa (19.0 t). The Australian nomination for 2024 was not recommended.
3. For the Australian strawberry runners, the nomination of 14.49 t was not recommended. MBTOC received information from the party indicating the likelihood of methyl iodide (MI) registration in 2022 in a process that includes use in combination with co-injection of chloropicrin (Pic). The party indicated that a co-formulation of MI/Pic improves the dispersal efficacy compared to separate co-injection into soil. Registration is thus being sought for the co-formulation of MI /Pic and is expected to be approved by mid-2023. Also, it was indicated that MI meets certification requirements and will be accepted by the Victorian Certification Authority.
4. MBTOC considered that if these timelines are correct, then MI and/or MI/Pic will be available for use in 2024 and therefore did not recommend the nomination. If the timelines cannot be met, there is time for a new nomination to be submitted in 2024.
5. In continuing the presentation, Mr Porter then explained that for the Canadian strawberry runners, final recommendation had been reduced by approximately 25%. The reduction was based on adoption of soilless substrates to replace MB for the total G2 tip production (50% of MB Use) over a 2-year period. The party had shown that required production levels are now being reached for a variety which will now be the focus for the future.
6. After the OEWG the party supplied a national management plan that only provided for a small reduction in MB for the short term. MBTOC acknowledges that the party has applied for a permit to evaluate chloropicrin for efficacy and groundwater issues in a test area in 2023.
7. For the nomination from the Republic of South Africa the final recommendation was 19 t. After the OEWG, RSA did not seek reassessment of the nomination. The recommended amount was a 5% reduction (1 t) of the nomination for 2023. MBTOC considered alternatives, such as sulfuryl fluoride are available to preserve structural timber known to be infested by woodboring beetles. The remaining 19.0 t is recommended as it is for use for fumigation of houses being sold that require a Certificate of Compliance. MBTOC acknowledges that the Party has indicated that this is the last year for applying for a CUN for this sector.
8. The co-chair then indicated that phase out of over 60,000 t of MB has been achieved under the MP. Additionally, more than 18,600 t of MB has been phased out under the CUN process since 2005, with only 3 nominations left for 40 t. This has led to an approximate 70% reduction in anthropogenic MB in the atmosphere. A large amount, (approx. 10,000 t MB is still used for exempted uses for QPS, however uncertainty over classification for QPS means some CUN uses may arise in the future.
9. In finalizing the presentation, the timelines for submission of CUNs in 2023 was presented.

B. Presentation of the Technology and Economic Assessment Panel on alternatives to hydrofluorocarbons

10. Ms. Bella Maranion, co-chair of the Technology and Economic Assessment Panel (TEAP) and on behalf of the Decision XXVIII/2 TEAP Working Group, began the presentation of the report. She noted that this report was volume 5 of the TEAP's 2022 Report and is based on the five Technical Options Committees (TOCs) sector assessment reports to be completed by the end of 2022.

* The summaries are presented as received, without formal editing.

She introduced the members of the TEAP Working Group which included members of the TEAP including a Senior Expert and Co-chairs of the Flexible and Rigid Foams, Halons, Medical and Chemicals, and Refrigeration, Air Conditioning and Heat Pumps TOCs. Decision XXVIII/2, paragraph 4, requested the TEAP to conduct periodic reviews of alternatives, using the criteria set out in paragraph 1(a) of decision XXVI/9, beginning in 2022 and every five years thereafter, and to provide technological and economic assessments of the latest available and emerging alternatives to hydrofluorocarbons (HFCs). The criteria for assessing alternatives in Dec. XXVI/9, paragraph 1(a), includes the following: commercially available; technically proven; environmentally sound; economically viable and cost effective; safe to use in areas with high urban densities considering flammability and toxicity issues, including, where possible, risk characterization; easy to service and maintain; and also considering the potential limitations of their use and their implications for the different sectors, in terms of, but not limited to, servicing and maintenance requirements, and international design and safety standards.

11. Ms. Maranion described TEAP's approach in responding to this decision. She noted that the first periodic review in 2022 aligns with the preparation of quadrennial assessment reports of TEAP and its TOCs under Decision XXXI/2. Given the coincidental timing of these two decisions, TEAP convened a Working Group to prepare a report responding to decision XXVIII/2, drawing from the 2022 TOC quadrennial reports, which are in preparation. The current report provides a preview of more detailed information and discussion to in the 2022 TOC assessment reports to be completed by the end of the year and presented to parties in 2023. Previous estimates by the TEAP showed the proportion of HFC consumption in the various sectors of use with refrigeration, air conditioning, and heat pumps (RACHP) manufacturing and servicing about 80% of consumption global warming potential (GWP)-weighted in 2015. Behind RACHP consumption are foams, aerosols and pressurized metered-dose-inhalers (pMDIs) and fire protection. Reported 2020 country programme HFC consumption from 115 out of 147 A5 parties indicates up to 95% of HFC consumption in A5 parties is for RACHP.

12. Mr. Ray Gluckman then began a presentation of information on alternatives to HFCs in the RACHP sectors. He noted that lower GWP alternatives to the popular high GWP HFCs are available for most RACHP applications, but there is limited accessibility to alternatives in some geographic regions

13. There is continued rapid development of new lower GWP refrigerants. There are a number of significant RACHP applications with widely available alternatives with GWP < 10; these use hydrocarbons (HCs), CO₂ (R-744), ammonia (R-717) and hydrofluoro-olefins (HFOs). For some applications alternatives with GWP of up to 750 can quickly be adopted, while for a few small applications, progress to lower GWP alternatives is currently slow.

14. Mr. Gluckman noted that the Decision XXVIII/2 report contained considerable detail, and the presentation was meant to highlight key information on the current usage of the popular high GWP HFCs; the RACHP applications where there is already a clear pathway towards lower GWP alternatives; and the applications where technical progress is more challenging. Four high GWP refrigerants represent most of this consumption, all classified as A1 (low toxicity and non-flammable): HFC-134a and HFC blends R-404A, R-507A, and R-410A. He provided an image showing the proportion of HFC consumption within the refrigeration and air conditioning applications. While there is a very wide variety of RACHP applications, the proportion of each application varies between parties based on factors such as local climate conditions. Different refrigerants are required to enable each application to be optimised; some of these key differences include the required size, temperature level, and location. There has been rapid development of lower GWP refrigerants with many already available for almost all RACHP applications. The four popular high GWP HFCs can be avoided in most new equipment. However, there may be limited accessibility to equipment and refrigerants in some geographic regions. Many lower GWP refrigerants are flammable, however, equipment can be designed to safely use flammable refrigerants in small-sealed systems and large systems in controlled access areas (e.g., machinery room/rooftop). Using flammable refrigerants is more problematic in medium-sized equipment located in public access areas; however, lower flammability (A2L) refrigerants are becoming widely used, and higher flammability (A3) refrigerants can be used in limited quantities with more safety control measures. Technician training is an important requirement for use of flammable refrigerants.

15. Mr. Gluckman then provided some tables with examples of refrigeration applications with alternatives with GWP less than 150 available and examples of air-conditioning and heat pump applications with alternatives available with GWP less than 10. He made special note of alternatives to the HFC blend, R-410A (GWP 2088), a high-pressure refrigerant that is mainly used for small and medium sized air-conditioning and heat pump systems. Technologies with GWP between 450 and 750

are available and some perform more efficiently than R-410A, such as HFC-32 (GWP 675) and HFO-HFC blends. There are refrigerants with GWP less than 150 but they are only suitable for limited R-410A applications. However, technical development is ongoing.

16. He then provided examples of air-conditioning and heat pump applications with available alternatives of GWP up to 750. There are some applications still reliant on high GWP refrigerants, including in sector with small consumption of HFCs. Transport refrigeration (vans, trucks, trailers, containers) was a major user of an HFC blend, R-404A (GWP 3922); HFO-HFC blend R-452A (GWP 2140) are now widely available, and lower GWP options are under development. For ultra-low temperature systems (e.g., freezers for vaccines at -70°C) utilise cascade refrigeration systems; these can use alternatives but are very high GWP gases, e.g., an HFC-PFC blend, R-508B (GWP 13,396) while lower GWP options remain mainly in the development stage.

17. Mr. Gluckman concluded his presentation noting that there could be minimal use of the popular high GWP HFCs in new equipment as the technical developments for lower GWP refrigerants mature for many RACHP applications. Accessibility issues need to be overcome by implementing, for example, measures to discourage import of equipment with high GWP HFCs, awareness programs related to lower GWP alternatives, and training related to use of flammable refrigerants.

18. Ms. Helen Walter-Terrinoni, co-chair of the Flexible and Rigid Foams Technical Options Committee (FTOC), provided an update on the status of alternatives to HFC foam blowing agents. She explained that there is no single foam blowing agent (FBA) substitute with the same technical properties and low cost of chlorofluorocarbons (CFCs), which made them a universal solution for foams, with every transition. This has led to a fragmentation of the FBA market.

19. She noted that there has been a continuing trend away from the use of fluorocarbon (FCs) use in foams. In fact, she commented that some markets, such as flexible foams, no longer use fluorocarbons (FCs) and are unlikely to be impacted by the HFC transition.

20. Ms. Walter-Terrinoni explained that foams are used in many ways: to provide structure (i.e., in appliances and boats), cushioning with a durable coating, thermal insulation etc. Foam manufacturers are working to optimize desired characteristics with cost, even creating new blends to develop a competitive advantage. She also commented that blends must be optimized for compliance with safety and performance testing, and testing requirements which can be different in different regions and nations.

21. She then explained that some manufacturers may revert to FCs to meet performance requirements (e.g., energy efficiency or structural requirements) from other FBAs.

22. Ms. Walter-Terrinoni then described the remaining challenges for the HFC transition especially for small- and medium-sized enterprises (SMEs) and Spray Foam. She went on to state that the transition in some regions and market segments (e.g., extruded polystyrene [XPS] and spray foam) may be delayed due to these ongoing challenges. She noted that SMEs are still facing challenges from the higher prices of HFOs/HCFOs or the potentially cost-prohibitive capital investment of HCs to address safety challenges for smaller companies. She then described the safety considerations for field-applied foams (e.g., spray foam), which limit alternatives.

23. Ms. Walter-Terrinoni commented on the evaluation of safety in high urban densities considering flammability and toxicity issues, including, where possible, risk characterization. She noted that HFO/HCFO foam blowing agents have similar toxicity exposure limits and routes to current FCs and that the same precautions should be taken to prevent exposure related to all the chemicals used in foam manufacturing.

24. She commented that hydrocarbons (HC) foam manufacture and use in densely populated areas can be challenging to mitigate. She specified that transportation of flammable FBAs in polyol blends can be limited by regulations in parties using the Global Harmonized System (GHS) definitions of flammability classes. She also explained that finished products are required to be tested for flammability and smoke in some jurisdictions to confirm that they are safe for use. Finally, she commented that HCs are volatile organic compounds (VOCs) and may require mitigation to avoid forming ground-level ozone or smog.

25. Ms. Walter-Terrinoni then shared summary tables of alternatives for HFCs in foams applications noting that there are alternatives to HFCs in commercial use in nearly every foam sector. She reiterated that challenges remain for SMEs due to cost, availability and safety considerations. She reminded parties that safety considerations limit options for field-applied foams (e.g., spray foam). Finally, she stated that the insufficient supply of HFO/HCFO FBAs has resulted in delayed conversions in some parties or reversion to HFCs for some companies.

26. Next Ms. Helen Tope, co-chair of the Medical and Chemicals Technical Options Committee (MCTOC), described the alternatives to HFCs in Medical and Chemical Use. Ms. Tope explained that she would discuss alternatives to HFC used in propellants and/or solvents in aerosols, propellants in pressurised metered dose inhalers (pMDIs) to treat asthma and chronic obstructive pulmonary disease (COPD), as solvents, including metal, electronics, and precision cleaning, in semiconductor and other electronics manufacturing (etching circuits, chamber cleaning, and heat transfer fluids to control temperature). Lastly, she said that she would provide an update on HFCs used as cover gases in magnesium production, casting processes and recycling to prevent oxidation and combustion of molten magnesium.

27. Ms. Tope explained that alternatives to HFCs in aerosols are widely available noting that most aerosols use HCs and dimethyl ether (DME) propellants, especially where these flammable propellants can be used safely. She clarified that a smaller proportion of aerosols use HFCs for VOC emissions mitigation (consumer), non-flammability (technical) or inhalation safety (topical medical).

28. She added more detail that VOC emission controls can limit use of HCs and DME, increasing use of compressed gases (nitrogen, nitrous oxide, carbon dioxide) and HFC-152a (GWP 124) in consumer aerosols. She then explained that some aerosols contain solvents, including HCFCs, HFCs, and a range of other alternatives.

29. Ms. Tope then provided additional information related to alternatives to HFCs for inhalers for asthma and COPD. She articulated that HFC pMDIs are the dominant option for inhaled therapy in most markets. She noted that Dry powder inhalers (DPI) and aqueous soft mist inhalers (SMIs) are alternatives, although, they are not all are universally available or suitable for use. She clarified that the proportion of pMDIs to DPIs and SMIs varies according to prescribing practices, availability, accessibility, cost, patient preference, or national government guidance for asthma and COPD treatments in different markets. She highlighted the fact that new in-kind alternative propellants with lower GWPs, HFC-152a and HFO-1234ze(E), are in early stages of development.

30. Next, Ms. Tope explained that alternatives to HFCs for solvents are widely available. She noted that HFCs are used as solvents to a much lesser extent than ODS, including for metal, electronics, and precision cleaning clarifying that HFCs are poor solvents: often mixed with chlorinated solvents to boost solvency. Solvents and technologies developed as ODS replacements are also HFC alternatives. There are a range of alternatives from which to choose.

31. Ms. Tope then described alternatives to HFCs used in semiconductor and other electronics manufacturing. She noted that HFCs -23 (GWP 14,800), HFC-32 (GWP 675), and HFC-41 (GWP 92) are used for etching and chamber cleaning. She then noted that alternatives include a range of fluorinated chemicals, many with higher GWPs, and one with a lower GWP <2. She clarified that HFCs might be a preferred environmental choice in this application.

32. Ms. Tope then provided an introduction to alternatives to HFCs used in Magnesium Production. She noted that sulfur hexafluoride (GWP 22,800) is the most widely used cover gas. She also explained that potential alternatives include HFC-134a (GWP 1430), a fluoroketone (GWP 0.1), sulfur dioxide (SO₂), and carbon dioxide. She then noted that some of these options are not always suitable. She noted that HFCs could be a preferred environmental choice in this application.

33. Mr. Adam Chattaway, co-chair of the Halons Technical Options Committee (HTOC), then described alternatives to the HFCs used in fire protection by sub-sector including civil aviation, military, ground vehicles, naval applications, aviation applications, oil and gas, general industrial fire protection, merchant shipping.

34. Mr. Chattaway described HFC usage in fire protection noting that HFCs are not used in some sub-sectors or applications where halons are used and that may never be a viable alternative to halons. He noted that there are some HFC alternatives being developed that do not currently meet all the criteria and that their status in several categories (“commercial availability”, “technically proven”, “economically viable”, and “easy to service”) may change in the future as research and development progress. He then informed parties that alternatives must be “environmentally sound” and “safe to use” or their use, or development for use, would be discontinued. He noted that the availability of an HFC alternative within a sub-sector does not mean that an alternative exists in every specific application in that sub-sector and that availability of an alternative for new designs does not mean it is viable for retrofit. Finally, he noted that some applications only have HFCs or the original halon as viable options.

35. Mr. Chattaway then described the trends away from use of halons, HCFCs and HFCs noting that the summary presented was limited in breadth and would not fully describe alternatives for all uses and jurisdictions. He noted that alternatives approved in one jurisdiction or application may not

be approved in another, especially because fire protection can be very specific to an individual application. He noted that national approval processes often vary from party to party or within a party and that specific local conditions can drive approvals or viability, including ambient temperature, size and/or weight limitations, logistical constraints. He noted that alternatives that might be viable for a new design might not be viable for retrofit of existing equipment. Finally, he stated that changes in regulations on HFCs and their alternatives could change this analysis.

36. Mr. Chattaway concluded his presentation by highlighting that for some subsectors, HFCs have never been used to replace halons, e.g., civil aviation cargo bays and airport crash fire rescue vehicles. Many but not all subsectors that use HFCs have potential alternatives, but it is possible that not all applications can use them, e.g., very low temperature oil and gas production or specific cases for space or weight issues. Some subsectors that use HFCs only have the original halon or HFCs as options, e.g., military armoured vehicle crew compartment and civil aviation lavatory extinguishers. He raised concerns related to perfluoroalkyl and polyfluoroalkyl substances (PFAS) and the way that it may be defined by some jurisdictions. He noted that many HFCs and some of their widely used fire protection alternatives could be classified as PFAS under some definitions, e.g., the OECD, the European Union and some US State definitions. He noted that restricting or prohibiting production, consumption or use of these agents could significantly impact the ability to implement alternatives to HFCs and halons which might leave halons as the only viable option. Mr. Chattaway provides the example that the Civil Aviation industry raised concern with including approved and candidate halon alternatives as PFAS during the 41st ICAO General Assembly, in September. He concluded that civil aviation and other sub-sectors might consider continued reliance on halons to ensure they have effective fire protection systems, increasing the strain on the halon bank

37. Ms. Maranion concluded the presentation by providing the key highlights of the report. Lower GWP alternatives to the high GWP HFCs are available for most applications, but there is limited accessibility to some alternatives in some geographic regions. There is still rapid development of lower GWP alternatives. The challenges remain for transition to alternatives in some applications due to cost, availability and safety considerations. For some specific applications, alternatives to current HFCs have even higher GWP. Future policies and regulations could potentially limit or reverse transition to alternatives assessed in this review, e.g., evolving policies and regulations related to PFAS.

38. She noted to parties that future reviews of alternatives to HFCs under Decision XXVIII/2 would no longer align with the TEAP quadrennial assessment report timelines. To streamline reporting, avoid duplication, and take into account TEAP workload, parties may wish to consider options for future reviews such as continuing the quadrennial assessment schedule and only providing updates to Decision XXVIII/2 when significant new information is available or shifting the quadrennial reports to a quintennial schedule.

C. Presentations by the assessment panels on progress in their work and key issues emanating from their 2022 quadrennial assessments

1. Presentation by the Scientific Assessment Panel

39. The SAP presented a summary of their 2022 Assessment. Thanks to actions taken under the Montreal Protocol the total cumulative concentration of ODSs in the atmosphere continues to decline as does the chlorine and bromine available for ozone destruction. The high emissions of CFC-11 detected during 2013-2018 and attributed to illegal production have fallen back towards expected values although it is impossible to determine whether all illegal production has ceased. Some unresolved questions remain. Carbon tetrachloride concentrations are declining at a slower rate than expected, possibly associated with its use as a feedstock. HFC23 emissions are significantly higher than expected. Unexplained emissions of some low concentration ODS gases have also been identified.

40. The recovery of stratospheric ozone continues with clearest evidence found in Antarctic spring and, year round, in the upper stratosphere. Models and observations disagree in the low stratosphere where the trend uncertainty is very large; ozone there has not shown signs of recovery. HFCs are increasing in the atmosphere but at slower rates than anticipated before the Kigali amendment. The amendment, as assessed, will avoid up to about 0.5°C of global mean warming by the end of this century. The assessment includes discussion of the role played by anthropogenic very short-lived chlorine substances.

41. For the first time, as requested by the Parties, the SAP assessment includes a chapter on the possible impact of so-called solar radiation management schemes (SRM) on stratospheric ozone. Against a background of global heating, SRM schemes have been discussed as a means of cooling the Earth surface. We present the background and, importantly, discuss the risks and uncertainties of SRM via artificial introduction of aerosol into the stratosphere. This scheme would affect stratospheric ozone by modifying both atmospheric chemistry and atmospheric transport of ozone. Important potential consequences, such as a deepening of the Antarctic ozone hole and delay in ozone recovery, have been identified.

2. Presentation by the Environmental Effects Assessment Panel

42. On behalf of the Environmental Effects Assessment Panel Co-chairs, Paul Barnes and Krishna Pandey, Co-Chair Janet Bornman presented the 2022 Quadrennial Assessment on the environmental effects of stratospheric ozone depletion, UV radiation, and interactions with climate change.

43. The topics covered included solar radiation, human health, terrestrial and aquatic ecosystems, troposphere and air quality, natural and synthetic materials, and two topical sections, microplastics in the environment and COVID-19.

44. The Montreal Protocol has been instrumental in preventing further growth of the Antarctic ozone hole and consequent large increases in UV radiation. It has also contributed to reducing global warming by phasing out ozone-depleting substances with high global warming potentials. Furthermore, without the Montreal Protocol, the large increases in UV-B (280-315 nm) radiation would have resulted in substantial reduction of carbon dioxide uptake by vegetation, resulting in an enhanced global warming from the carbon dioxide not stored.

45. With respect to human health, millions of skin cancers and eye diseases have been avoided, although incidence of skin cancers is still high in many countries. UV radiation is associated with several eye diseases, especially cataract, which is the main cause of blindness globally. Drug-induced skin sensitivity to solar UV radiation also results in severe loss of quality of life. With regard to the corona virus, SARS-CoV-2, it was noted that the many positive outcomes of the Montreal Protocol far outweigh any potential advantage for disinfection of the virus by higher amounts of solar UV radiation.

46. The Assessment has continued to emphasise the interactive effects on ecosystems of UV radiation and extreme climate events (ECE) associated with increased global warming from greenhouse gas emissions and changes in stratospheric ozone. ECEs are occurring together with the more gradual changes in the environment, such as the rising surface temperatures and carbon dioxide.

47. Additional factors are contributing to the burden of changes in terrestrial and aquatic ecosystem as oil spills, sunscreens, pesticides, and plastic debris enter the environment and are degraded further by solar UV radiation, facilitating uptake by biological organisms. The risks to biodiversity and survival of tropical coral reefs from high amounts of UV radiation and pollution, as well as the sensitivity of the corals to small changes in temperature were also noted.

48. UV radiation is also important in controlling air quality in the troposphere, which has significant consequences for human health and the environment. UV-B radiation is responsible for generating the main cleaning agent, the hydroxyl radical (OH), in the troposphere. The OH radical removes many substances emitted by human activities and natural processes, such as methane, and the ODS replacements, HFCs, HCFCs, HFOs. However, in the process, these ODS replacements are degraded to trifluoroacetic acid (TFA). TFA continues to raise some concern because of its presence in the environment and potential toxicity. However, current assessments indicate that adverse effects in the foreseeable future are unlikely, but the possible risks should still be monitored. Apart from the high yields of TFA from certain of the HFCs, HCFCs, HFOs, high concentrations of TFA are also generated from substances not currently under the Montreal Protocol.

49. In conclusion, reference was made to the ongoing contributions of the Montreal Protocol to environmental sustainability, human health and well-being in alignment with many of the UN Sustainable Development Goals (SDGs).

3. Presentation by the Technology and Economic Assessment Panel

50. Ms. Bella Maranion, co-chair of the Technology and Economic Assessment Panel (TEAP) and on behalf of the other co-chairs Ms. Marta Pizano and Mr. Ashley Woodcock, introduced TEAP's presentation on the progress of work and key issues emerging from TEAP 2022 Assessment Reports. She presented a full list of the 20 current TEAP members, consisting of the three co-chairs, five Senior

Expert members, and twelve co-chairs of the five Technical Options Committees: Flexible and Rigid Foams, Halons, Methyl Bromide, Medical and Chemicals, and Refrigeration, Air Conditioning and Heat Pumps. On behalf of the TEAP co-chairs, she expressed their gratitude to the continuing efforts of the TOC co-chairs and their members to complete their sector assessment reports by the end of the year. On behalf of the panels, she expressed the appreciation for the continued support of the Ozone Secretariat on the work of all the panels. The 2022 Assessment Reports respond to Decision XXXI/2 which requests the panels to bring to the notice of the parties any significant developments. With regard to TEAP, the parties request that its assessment should include the following topics:

- (a) Technical progress in the production and consumption sectors in the transition to technically and economically feasible and sustainable alternatives and practices that minimize or eliminate the use of controlled substances in all sectors;
- (b) The status of banks and stocks of controlled substances and the options available for managing them so as to avoid emissions to the atmosphere;
- (c) Challenges facing all parties to the Montreal Protocol in implementing Montreal Protocol obligations and maintaining the phase-outs already achieved, especially those on substitutes and substitution technologies, including challenges for parties related to feedstock uses and by production to prevent emissions, and potential technically and economically feasible options to face those challenges;
- (d) The impact of the phase-out of controlled ozone-depleting substances and the phase down of HFCs on sustainable development;
- (e) Technical advancements in developing alternatives to HFCs suitable for usage in countries with high ambient temperatures, particularly with regard to energy efficiency and safety. TEAP to Technology and Economic Assessment reports to consider,

51. Miss Maranion then introduced the highlights from each sectors upcoming Assessment Report.

52. For the foams sector, Miss Maranion described the substantial and continued progress in the adoption of low or zero GWP foam blowing agents. She described the challenges of the higher costs of hydrofluoro-olefins and hydrochloro-olefins and of flammable foam blowing agents for Small and Medium Enterprises, and for field-based spray foams. She emphasized that there are supply shortages of alternatives to HFC foam blowing agents in both A5 and non-A5 parties. The Foams Assessment Report will include technical progress, and information on banks, stocks and emissions.

53. For the halons sector, Miss Maranion described the evolution of fire suppressants from halons to high GWP HFCs in new systems in A5 parties. The size of the fire protection bank of HFC-227ea is estimated by the HTOC to be ~180,000 tonnes by the end of this 2022, much of which is in A5 parties. A new low-GWP blend is in early development. It has been added to the US EPA Significant New Alternatives Policy program list and has been adopted into internationally recognised fire protection standards.

54. In terms of individual emissions, halon-1301 is showing an irregular pattern, halon-1201 exceeds reported annual production, and halon-2402 has increased since 2017 which is inconsistent with a business-as-usual scenario. Proposed changes to legislation of molecules classed as PFAS could affect HFCs and HFC alternatives which might leave halons as the only viable option.

55. Recovered halons are reported to be increasingly contaminated and require additional effort to recycle with potentially additional losses. This could affect the future halon 1301 bank.

56. For methyl bromide (MB), Miss Maranion provided some key points from the Assessment Report. Global methyl bromide production for quarantine and pre-shipment (QPS) use is stable. One party has increased production dramatically from 2015 till 2020. MB consumption for controlled use was now only 43.6 t in 2021 compared to 16,050 t in 2005. Technical alternatives now exist for all pre-plant soil and non-QPS structural and commodity uses of MB. She reported that there are growing concerns about an important MB alternative Sulfuryl fluoride (SF; GWP 7510) which is widely registered and adopted around the world for treatment of empty structures (e.g., flour mills, food premises, etc.); adoption of emission reduction measures may be needed.

57. Miss Maranion noted that QPS consumption remains at 10,000 t/yr, with 95% of consumption in 17 parties, and 9,000 t emitted. In the absence of uptake of QPS alternatives, recapture technologies are available. Successful alternatives such as irradiation and ethane-dinitrile (EDN) are being implemented for important QPS uses, EDN is a new alternative on timber for a major quarantine use (~700 t) in New Zealand and South Korea, and has the potential for similar uses globally.

58. For the medical and chemicals sector, Miss Maranion reported on the scope of the assessment report. This responds to decisions, including HFC Alternatives, HCFC availability, process agents, laboratory and analytical uses, n-propyl bromide, destruction technologies. It covers areas including Production, including feedstocks; Process agents; Solvents; Semiconductor and other electronics manufacturing; Magnesium production; Laboratory and analytical uses; End-of-life management and destruction; Aerosols; Pressurised metered dose inhalers and Sterilants.

59. The report will provide information on:

- (a) production and trends, including feedstock, by-products, intermediates, carbon tetrachloride (CTC), very short-lived substances (VSLS) (including dichloromethane), and related emissions;
- (b) detailed production processes that result in potential HFC-23 emissions;
- (c) HFCs not listed in Annex F (decision XXIX/12);
- (d) information on end-of-life chemicals management and related issues and challenges, available banks, and the destruction of controlled substances
- (e) technical progress in solvents, laboratory and analytical uses, aerosols, MDIs, sterilants;
- (f) sectors not previously reported, semiconductor and electronics manufacturing and magnesium production.

60. For the refrigeration, air conditioning, and heat pumps sector, Miss Maranion indicated that the Assessment will include a review technology progress, a discussion on present refrigerant options for new and existing applications, and energy efficiency opportunities. A tool for refrigerant selection based on sustainability criteria is described, new refrigerants and refrigerant mixtures are reported along with their ODP, GWP, properties, and safety, and there will be an update in Not-in-Kind Technologies.

61. Ms. Maranion summarized that the TOCs are continuing their work on their sector assessments to be completed by the end of 2022. The crosscutting issues in the 2022 TEAP Assessment will include: the status of global and sector phaseout of ODS and phase-down of HFCs; technical and economic challenges to transition to alternatives; status of banks and stocks of controlled substances and options available for responsible management to avoid emissions; impact of the phase-out of controlled ODS and the phase down of HFCs on sustainable development. TEAP is coordinating with SAP and EEAP on crossover issues for its assessment, which will then form the basis for the Synthesis Report. The timeline for completing its assessment is for the TOCs to submit their reports to the Ozone Secretariat by 31 December 2022, for the TEAP Assessment Report to be submitted for the 45th Open Ended Working Group meeting, and to coordinate with the other panels to submit the Synthesis Report.

Annex II

Statement by the Chair of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol on the work of the Executive Committee, the Multilateral Fund secretariat and the Fund's implementing agencies*

Mr. President, distinguished delegates.

On behalf of the Executive Committee of the Multilateral Fund, I am pleased to report to the Parties on the relevant decisions taken since the Thirty-third Meeting of the Parties in 2021.

Since then, the Committee held three meetings, the 88th, the 89th and the 90th. The 88th meeting was held through a combination of online formal and virtual contact group meetings and an intersessional approval process. The first part of the 89th meeting was held in a virtual format, but the Committee was able to hold the second part of the 89th meeting and the 90th meeting back-to-back in person in Montreal in June of this year. The Committee was able to make progress on several policy issues at the 89th meeting, dedicated to discussing outstanding policy matters.

Mr. President, in my statement today I will share some of the significant results achieved on ongoing work related to HCFC phase-out and matters relating to the Kigali Amendment, which are described in document UNEP/OzL.Pro.34/7. Parties may wish to note that this document also includes full information on policy matters; projects approved, status on their implementation and monitoring; and business planning, financial and administrative matters, that have been considered by the Executive Committee.

Since the last Meeting of the Parties, the Executive Committee continued to focus its work on monitoring the implementation of the HCFC phase-out management plans, referred to as HPMPs, and an HCFC production phase-out management plan, referred to as an HPPMP, along with the preparation and planning for the HFC phase-down. At the 90th meeting, the Committee reaffirmed that the principles of eligible incremental costs of HCFC phase-out projects for stage II of HPMPs, established in decision 74/50, would continue to apply in the future stages.

The Executive Committee also held discussions on the draft HCFC production sector guidelines and the standard format used for the verification of ODS production phase-out but was unable to complete its discussion, which the Committee will continue at a future meeting.

The Committee also addressed the following issues: institutional strengthening; parallel or integrated implementation of HCFC phase-out and HFC phase-down activities; the draft cost-guidelines for funding the phase-down of HFCs in Article 5 countries; energy efficiency matters while phasing down HFCs; and key aspects related to HFC-23 by-product-control technologies.

I would like to briefly highlight the discussions and decisions made on these items.

- Regarding institutional strengthening projects, the Executive Committee requested the Secretariat to discuss with the bilateral and implementing agencies matters related to the review of the existing format of terminal reports and requests for extension of institutional strengthening funding and to the selection of a set of performance indicators that could be used consistently by all Article 5 countries and to report back to the Executive Committee at its 91st meeting. The Committee will continue its consideration of the review of institutional strengthening projects, including funding levels, at the 91st meeting, based on the working text that was being discussed at the 89th meeting.
- The Executive Committee also requested the Secretariat to prepare an analysis related to the capacity of the Multilateral Fund institutions to address HFC phase-down, for its consideration at the 91st meeting.
- When discussing the draft cost guidelines for the phase-out of HFCs, the Executive Committee considered the synthesis report describing best practices and ways to make operational paragraph 24 of decision XXVIII/2 on disposal and the analysis of the incremental capital costs and incremental operating costs, their duration, and the cost-effectiveness of all approved investment projects in the relevant manufacturing sectors and subsectors. The Committee came to agreement on the issue of disposal of used or unwanted controlled substances and decided to

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provide flexibility for Article 5 countries to include activities related to the environmentally sound management of these substances, including disposal, both in refrigeration servicing sector plans under HPMPs and in stage I of Kigali HFC implementation plans, referred to as KIPs.

- The Committee also agreed on an interim basis on cost-effectiveness thresholds for the rigid polyurethane (PU) foam sector, with special consideration for small and medium-sized enterprises; the domestic refrigeration manufacturing sector; and on the use of a case by-case approach for the flexible PU foam, integral skin, extruded polystyrene foam, aerosol, fire extinguishing, solvent, metered-dose inhalers, and mobile air-conditioning sectors. The Committee also requested the Secretariat to develop, for its second meeting in 2022, criteria for a funding window to provide Article 5 countries with assistance to prepare an inventory of banks of used or unwanted controlled substances and to develop a plan for the collection, transport, and disposal of such substances. The Committee agreed to pursue, at the 91st meeting, consideration of the non-resolved issues based on the working documents on the cost-effectiveness thresholds and the starting point for sustained aggregate reductions in HFC consumption and production.
- Although agreement has yet to be reached, the Executive Committee continued to make progress on its discussion of the analysis of the level and modalities of funding for HFC phase-down in the refrigeration servicing sector, based on the updated information provided by the Secretariat. Discussion will continue this item at the 91st meeting.
- Regarding energy efficiency while phasing down HFCs, the Executive Committee noted the report identifying options, including the relevant procedures and conditions, for mobilizing financial resources to maintain and/or enhance energy efficiency when replacing HFCs with low-GWP alternatives. The recommendation of the Committee included three areas of work for the Secretariat. First, to develop, for consideration by the Executive Committee at its 91st meeting, criteria for pilot projects to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of the HFC phase-down. Second, to prepare an operational framework to further elaborate on institutional aspects and projects and activities that could be undertaken by the Multilateral Fund for maintaining and/or enhancing the energy efficiency of replacement technologies and equipment in the manufacturing and servicing sector when phasing down HFCs in specific categories set out in the report. Third, to request the Secretariat to continue its consultations with relevant funding institutions on opportunities for sharing information on policies, projects and relevant funding modalities relating to maintaining and/or enhancing energy efficiency while phasing down HFCs and to report back to the Executive Committee at its 91st meeting.
- The Executive Committee also decided on the level of additional funding to be provided to address specific needs that might arise during project implementation relating to introduction of alternatives to HCFCs with low- or zero-GWP and for maintaining energy efficiency in the refrigeration servicing sector in low-volume consuming countries. The level of additional funding was based on the level of HCFC baseline consumption in the refrigeration servicing sector.
- Regarding controlling HFC-23 by-product emissions, the Executive Committee noted a document on key aspects related to HFC-23 by-product control technologies. The Committee also invited the relevant Article 5 country to consider requesting additional funding for independent verification of the HFC-23 by-product generated, destroyed, sold, stored, and emitted, under the subsequent stage of its HPMP, until approval of its KIP, at which time verification would continue under the latter plan.

Before I conclude, I would like to thank and share with all parties the main achievements of the implementing agencies of the Multilateral Fund, despite the challenges faced by them during the reporting period.

UNDP

UNDP is providing technical support to 47 countries to meet their HCFC targets under the Montreal Protocol. UNDP is also supporting 19 countries to undertake enabling activities for ratification and early implementation of the Kigali Amendment, out of which 13 countries have ratified the Kigali Amendment. Four HFC investment projects in Bangladesh, China, Dominican Republic and Mexico have also been completed successfully on time, collected actual cost information, phased down HFCs, and achieved significant improvement of energy efficiency in their products. Furthermore, UNDP has received approval from the Multilateral Fund to provide support to

28 countries to prepare their KIPs as the lead or cooperating agency. UNDP has continued to enhance the capacity building of Article 5 countries by organizing more than 30 online webinars on technical topics, including on the requirements for licensing and quota systems for HFCs to implement the Kigali Amendment, addressing the challenges of new technologies and energy efficiency in the refrigeration and air-conditioning sector, and delivering energy efficient and climate friendly cooling through National Cooling Action Plans in 12 countries, to exchange information among Article 5 countries and provide training to national ozone units and stakeholders remotely. Finally, to strengthen the application of the Multilateral Fund's new Operational Policy on Gender Mainstreaming for UNDP's Montreal Protocol portfolio, one webinar on gender and the Montreal Protocol was organized by UNDP in 2022.

UNEP

UNEP, through the OzoneAction Compliance Assistance Programme, assists all Article 5 Parties to meet and sustain their compliance with Montreal Protocol obligations. It supported 103 countries with institutional strengthening projects, helped them report timely and accurate data, and assisted them to meet their HCFC phase-out commitments through 102 HPMPs, Regional Networks of Ozone Officers, Information Clearinghouse products, and compliance assistance services. UNEP promoted the Kigali Amendment ratification, provided guidance for HFC policy setting, and assisted with the establishment of HFC licensing systems. UNEP continued assisting 93 countries with enabling activities projects and supported 39 countries with the preparation of their KIPs. Through partnerships, UNEP continued to help the refrigeration and air-conditioning servicing sector safely adopt low-GWP, energy efficient technologies. Throughout the COVID-19 pandemic, UNEP continued to support Ozone Officers with continuity of their Montreal Protocol implementation using virtual means and innovative approaches.

UNIDO

UNIDO is currently implementing HPMPs in 64 countries, institutional strengthening projects in 13 countries, projects on HFC-23 by-product emission destruction in 2 countries and has almost completed HFC enabling activities in 31 countries. Despite the pandemic, UNIDO managed to maintain implementation of the portfolio with the main issues identified being equipment installation for industry conversions due to travel restrictions, supply chain problems as well as increasing freight prices. Further, at the 88th and 90th meetings of the Executive Committee UNIDO received approval for preparatory funding for KIPs for 23 countries, increasing the total number that UNIDO supports to 35 countries.

World Bank

The World Bank continues to assist its partner countries in delivering stage II of their HPMPs, not only to achieve HCFC consumption and production reductions in accordance with their obligations but also to sustain and even further reduce consumption and production towards the 2025 compliance target. The Bank also supports countries' readiness for HFC phase-down and the compliance with the Kigali Amendment through technical assistance and advisory services, as well as through KIP preparation activities. Through its institution-wide assistance to both large and low-volume consuming countries, the World Bank is also exploring ways to maximize climate mitigation co-benefits across key economic sectors through sustainable cooling alongside avoidance of high-GWP HFCs.

Mr. President, distinguished delegates,

Finally, I would like to take this opportunity to express my sincere appreciation to the members of the Executive Committee for their support in my role as the Chair, the Fund Secretariat, and the bilateral and implementing agencies, for their continued hard work and dedication to our common goals.

I would also like to thank the Parties for their strong commitment to the implementation of the Montreal Protocol.

Thank you

Annex III

National statements*

A. **Statement on the situation in Ukraine by the representative of Canada on behalf of Australia, Canada, Japan, New Zealand, Norway, Switzerland, the United Kingdom and the United States of America**

And now distinguished delegates, I will turn my attention to Russia's military aggression. My remaining statement is provided on behalf of Australia, Canada, Japan, New Zealand, Norway, Switzerland, the United Kingdom, and the United States of America:

We condemn the ongoing mounting casualties and widespread destruction, including environmental damage and transboundary harm, caused by Russia's military aggression against Ukraine. Our thoughts are with the people of Ukraine.

This aggression is a violation of international law, including the UN Charter. Russia's actions violate the prohibition of the use of force, and the territorial integrity and political independence of Ukraine, as enshrined in international law. We support efforts to hold those responsible to account.

We call once again on Russia to abide by its international obligations, cease all hostilities in Ukraine, withdraw its troops, facilitate the rapid, safe, and unhindered access of humanitarian assistance to those in need in Ukraine.

Thank you

B. **Statement on the situation in Ukraine by the representative of the European Union and its member States**

First of all, please, let me bring up an issue of the utmost concern about the crucial benefit of the multilateral cooperation regarding the environmental issues also including the Montreal Protocol.

Multilateral cooperation, based on mutual respect, is crucial to address the huge environmental challenges ahead of us. We therefore recall our deep concern and condemn Russia's unprovoked and unjustified act of aggression against Ukraine with the complicity of Belarus, which grossly violates international law and the UN Charter, and undermines international security and stability. We demand that Russia immediately ceases its military actions, withdraws all its troops from the entire territory of Ukraine and fully respects Ukraine's territorial integrity, sovereignty and independence within its internationally recognised borders. We likewise recall the resolution ES-11/4, supported by 143 Member States of the United Nations, reaffirming the territorial integrity of Ukraine within its internationally recognized borders, and welcoming the efforts of the United Nations, Member States, and other organizations to respond to the crisis.

* At the time of the adoption of the present report, the representatives of two parties, each of whom spoke on behalf of a group of parties, requested that their statements pertaining to the situation in Ukraine be reflected in the present report. The statements are reproduced as received, without formal editing.