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Thirty-ninth meeting
Bangkok, 11–14 July 2017

Report of the thirty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer

I. Opening of the meeting

1. The thirty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer was held at the United Nations Conference Centre, Bangkok, from 11 to 14 July 2017. The meeting was co-chaired by Mr. Cheikh Ndiaye Sylla (Senegal) and Ms. Cynthia Newberg (United States of America).

2. The meeting was opened at 10 a.m. on Tuesday, 11 July 2017, by Mr. Sylla.

3. Opening statements were made by Mr. Somchai Harnhiran, Permanent Secretary, Ministry of Industry of Thailand, and Ms. Tina Birmpili, Executive Secretary, Ozone Secretariat.

4. In his statement, Mr. Harnhiran said that the historic agreement that had been reached in Kigali represented the beginning of a new chapter for the Montreal Protocol. In that regard, he highlighted the need to strengthen the policy and regulatory infrastructure required for establishing enforceable national licensing systems for hydrofluorocarbons (HFCs) and for facilitating both the phase-down of HFCs and the introduction of low-global-warming-potential (GWP) alternatives. It was also important to strengthen the technical capacity of parties to manage flammable low-GWP alternatives and to reinforce related safety regulations and standards. He stressed the importance of bearing in mind the link between the ongoing phase-out of hydrochlorofluorocarbons (HCFCs) and the phase-down of HFCs, and ensuring that parties' efforts to avoid a transition from HCFCs to high-GWP HFCs did not hamper their ability to meet their HCFC obligations, or compromise public safety or the market acceptance of their products. He noted that the Working Group was set to agree on the definitions of "high-GWP" and "low-GWP" HFCs in order to provide clear guidance for all parties to chart their future phase-down targets for HFCs.

5. During the negotiation of the Kigali Amendment, ensuring energy efficiency in refrigeration and air-conditioning equipment had been considered another important means of achieving climate co-benefits. Also, as it had been agreed in decision XXVIII/2, there were certain areas that parties would need to consider in order to be eligible for support from the Multilateral Fund for the Implementation of the Montreal Protocol in addressing the emerging challenges of Article 5 parties. The decision by the parties on the level of replenishment of the Fund for the 2018–2020 triennium would send a clear signal as to whether their actual commitment matched the ambitions that had been expressed in Kigali.

6. Ms. Birmpili, in her statement, said that, by linking the two worldwide challenges of ozone depletion and climate change, the Kigali Amendment and resulting decisions would form a new narrative for international environmental governance in the coming years. Marking the thirtieth anniversary of the Montreal Protocol, 2017 was a year of celebration, but also a year for laying the foundations for the implementation of the Kigali Amendment. She congratulated the four parties – Mali, the Marshall Islands, the Federated States of Micronesia and Rwanda – that had taken immediate action and had already ratified the Amendment, noting that other countries had started national preparations towards ratification. The Ozone Secretariat had prepared a Kigali Amendment calendar for the present meeting as an indication and a reminder of all the issues that had to be addressed by 2047.

7. She drew attention to the "Ozone heroes" awareness-raising campaign that would run over the period between World Ozone Day 2017, on 16 September, and the Twenty-Ninth Meeting of the Parties, to be held from 20 to 24 November 2017. The campaign would target mainly young people who were unfamiliar with the issue of ozone depletion, demonstrating that a topic generally considered to be complex and overwhelming could, in fact, be addressed effectively when people worked together.

8. She cautioned against complacency amid the anniversary celebrations, stressing the need to remain aware of emerging issues, such as those described in the report recently released by the World Climate Research Programme under its Stratosphere-troposphere Processes and their Role in Climate (SPARC) project, entitled "SPARC Report on the Mystery of Carbon Tetrachloride" and in another recent study on dichloromethane. The Scientific Assessment Panel and the Technology and Economic Assessment Panel would provide advice to parties with regard to the projections set forth in those studies.

9. She drew attention to other issues that would be discussed at the present meeting, such as the preliminary report by the Technology and Economic Assessment Panel on the replenishment of the Multilateral Fund for the triennium 2018–2020; opportunities offered by the Kigali Amendment to improve the energy efficiency of appliances and equipment in the refrigeration and air-conditioning sector; and the proposed revision of the Article 7 data reporting forms to include HFCs. She said that before the end of 2017, the Ozone Secretariat would introduce an online reporting tool that would make the process of data reporting easier and more efficient.

10. In relation to the workshop on HFC safety standards held immediately prior to the current meeting, on 10 July 2017, she recalled that the Technology and Economic Assessment Panel, through its task force report, would highlight the working procedures of international standard bodies and the progress made in the revision of important international safety standards, and would propose recommendations in that regard.

11. Lastly, Ms. Birmpili paid tribute to two party representatives who were moving on in their careers, namely Mr. Rafael da Soler from Brazil and Mr. Manoj Kumar Singh from India, thanking them both for their support and contributions over their years of service to the Montreal Protocol.

II. Organizational matters

A. Attendance

12. The following parties to the Montreal Protocol were represented: Afghanistan, Albania, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Belarus, Belgium, Belize, Benin, Bhutan, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chile, China, Colombia, Comoros, Congo (Republic of the), Costa Rica, Côte d'Ivoire, Cuba, Czechia, Democratic People's Republic of Korea, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, European Union, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Grenada, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Japan, Jordan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Lithuania, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritius, Mexico, Micronesia (Federated States of), Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Nepal, Netherlands, New Zealand, Niger, Nigeria, Norway, Oman, Pakistan, Papua New Guinea, Paraguay, Philippines, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Rwanda, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, the former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Tunisia, Turkey, Tuvalu, Uganda, Ukraine, United

Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Zambia, Zimbabwe.

13. The following United Nations entities, organizations and specialized agencies were represented: secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, United Nations Development Programme, United Nations Environment Programme, United Nations Industrial Development Organization (UNIDO), World Bank. The Montreal Protocol assessment panels were also represented.

14. The following intergovernmental, non-governmental and industry bodies and organizations were represented as observers: AECOM-Australia, A-Gas (Thailand) Ltd., AGC Chemicals, Air-conditioning, Heating and Refrigeration Institute, Alliance for Responsible Atmospheric Policy, Association of Ammonia Refrigeration, Arkema Innovative Chemistry, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), BASF (Thai) Limited (Thailand), Beijing Yuji Science and Technology Co., Ltd., Blue Star Ltd., Building Efficiency, Central Glass Co., Ltd., China Household Electrical Appliances Association (CHEAA), Climalife, Climate Watch Thailand, Council on Energy, Environment and Water, Daikin Europe N.V., Daikin Industries, Ltd., Daikin U.S. Corporation, Danfoss A/S (Denmark), DWA Indonesia, Embraco Europe S.r.l., Emergent Ventures India, Emerson Commercial and Residential Solutions, Energy Studies Institute, Environmental Investigation Agency-Global, European Environmental Citizens Organization for Standardization (ECOS), European Partnership for Energy and the Environment, Federation of Thai Industries, Fire and Environment Protection Network and Nohmi Bosai., Ltd., GIZ Proklima, Global Health Asia Institute, Gluckman Consulting, Godrej and Boyce Mfg. Co., Ltd., Gujarat Fluorochemicals Ltd., Halon Banking Systems, Honeywell, ICF International, IKKE GmbH, Indian Chemical Council, Institute for Governance and Sustainable Development, Institute of Standards and Industrial Research of Iran, International Electrotechnical Commission, International Organization for Standardization, International Pharmaceutical Aerosol Consortium, Japan Refrigeration and Air-Conditioning Industry Association, Johnson Controls, Kulthorn Group, Lawrence Berkeley National Laboratory, Lennox International, LNC Private, Ltd., Matthias Meier Technical Consulting, MEBROM, MEFCHEM Consulting Sarl, Mexichem UK Ltd., Midwest Refrigerants, LLC, Mitsubishi Electric Corporation, National Institute of Advanced Industrial Science and Technology, Natural Resources Defense Council, Oak Ridge National Laboratory, Pakistan Standards and Quality Control Authority, Panasonic Corporation, Refrigerant Gas Manufacturers Association, PREC Institute, Refrigerants Australia, Refrigeration and Air-Conditioning Manufacturers Association of India, Ref-Tech, Saijo Denki, Shecco, SRF Limited, Sri Lanka Standards Institution, Sun Yat Sen University, Sustainable Agriculture and Environment Development Association, The Chemours Company, The Climate Reality Project, The Energy and Resources Institute, Tianjin University of Commerce, Topten International Services, Toshiba Carrier Corporation, United Technologies Climate, Controls and Security, United Technologies Corporation, University of Cambridge, University of Maryland, University of Southern California, University of Tokyo, Victorian Strawberry Industry Certification Authority, Wagner Consultancy, Walton Hi-Tech Industries, Ltd., Yawatz Engenharia, Ltda., Zhejiang Normal University, Zhejiang University of Technology, independent consultants.

B. Adoption of the agenda

15. The Co-Chair highlighted a request made by the Ministry of Environment of the United Arab Emirates for the deletion of provisional agenda item 9, pertaining to the eligibility of the United Arab Emirates for technical and financial assistance under the Multilateral Fund. He also noted that additional issues had arisen from the Technology and Economic Assessment Panel 2017 report, namely relating to process agent uses and key messages of the Panel, which would be included under item 5 (d).

16. Accordingly, the Working Group adopted the following agenda on the basis of the provisional agenda set out in document UNEP/OzL.Pro.WG.1/39/1, as orally amended:

1. Opening of the meeting.
2. Organizational matters:
    (a) Adoption of the agenda;
    (b) Organization of work.
3. Kigali Amendment to the Montreal Protocol to phase down hydrofluorocarbons:
    (a) Data reporting under Article 7 and related issues;

(b) Work by the Scientific Assessment Panel on updating the global-warming potential of the substances in Group I of Annex A, Annex C and Annex F to the Montreal Protocol (UNEP/OzL.Pro.28/12, para. 204);

(c) Process for approving destruction technologies for substances in Annex F to the Montreal Protocol (Article 2J, paras. 6 and 7);

(d) Progress by the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol in relation to decision XXVIII/2.

4. Replenishment of the Multilateral Fund for the triennium 2018–2020, including the report by the Technology and Economic Assessment Panel (decision XXVIII/5).

5. Technology and Economic Assessment Panel 2017 report (volumes I and II), including issues relating to:

(a) Nominations for essential-use exemptions for 2018;

(b) Nominations for critical-use exemptions for 2018 and 2019;

(c) The phase-out of hydrochlorofluorocarbons (decision XXVIII/8);

(d) Organizational and other matters, including process agent uses and key messages from the Technology and Economic Assessment Panel;

6. Safety standards relevant to low-global-warming-potential alternatives (decision XXVIII/4):

(a) Results of the workshop on safety standards relevant to the safe use of low-global-warming-potential alternatives;

(b) Report by the Technology and Economic Assessment Panel on safety standards.

7. Energy efficiency (decision XXVIII/3).

8. Consideration of hydrofluorocarbons not listed in Annex F to the Montreal Protocol (UNEP/OzL.Pro.28/12, para. 197).

9. Other matters.

10. Adoption of the report.

11. Closure of the meeting.

C. Organization of work

17. The Working Group adopted a proposal on the organization of work presented by the Co-Chair, agreeing to establish contact and informal groups, as necessary, and not to hold night sessions; to avoid holding contact group meetings in parallel with each other or with plenary meetings; and to avoid, to the extent possible, the holding of simultaneous informal group meetings.

III. Kigali Amendment to the Montreal Protocol to phase down hydrofluorocarbons

18. Introducing item 3 of the agenda, the Co-Chair of the Open-ended Working Group recalled that, together with decision XXVIII/2, decision XXVIII/1, on further amendment of the Montreal Protocol, by which the Twenty-Eighth Meeting of the Parties had adopted the Kigali Amendment in October 2016, represented the culmination of the hard work of and cooperation among the parties in seeking to address the issue of HFCs. A series of key practical matters now needed to be considered so that parties could plan for implementing the provisions of the Amendment.

A. Data reporting under Article 7 and related issues

19. Turning to sub-item 3 (a), the Co-Chair drew attention to the background information set out in the notes by the Secretariat on data reporting under Article 7 of the Montreal Protocol and related issues arising from the Kigali Amendment to the Montreal Protocol to phase down HFCs (UNEP/OzL.Pro.WG.1/39/3) and on issues for discussion by and information for the attention of the Open-ended Working Group at its thirty-ninth meeting (UNEP/OzL.Pro.WG.1/39/2). She observed that the issue could be broken down into four separate topics, which she invited the parties to consider in turn.

20. On the first topic, the timeline for reporting of baseline data for HFCs by parties operating under paragraph 1 of Article 5 (Article 5 parties), the Co-Chair stated that, as mentioned in the note by the Secretariat (UNEP/OzL.Pro.WG.1/39/3), paragraph 2 of Article 7 of the Kigali Amendment could be understood to mean that Article 5 parties ratifying the amendment before their baseline year would have to report baseline data for future years. The Secretariat was requesting parties to clarify whether Article 5 parties should report estimated data for future years or whether they should wait until real data became available for the baseline years in question.

21. Several representatives expressed the view that a pragmatic solution was needed. Although paragraph 2 of Article 7 provided for the submission of estimated data, if parties reported forward estimates for their baseline data which then proved to be inaccurate when the real data became available, they would have to apply, through the Implementation Committee, for changes in their baseline data, which was a cumbersome and time-consuming process. It would be preferable for parties to report accurate data which reflected the position on the ground. Several representatives suggested that this reporting should take place in the year following the baseline year, or within three months of ratification if that should be later; one party suggested a deadline of 1 June in the year following the baseline year, although others said that a later date would be preferable. Another recommended that the period of three months after ratification was rather short and could perhaps be extended.

22. One representative commented that she hoped the Executive Committee of the Multilateral Fund would be able to be flexible in providing support for Article 5 parties wishing to carry out phase-out projects for HFCs before their baseline years, as they had in the past in similar circumstances. Another representative observed that some Article 5 parties had already been able to carry out studies for inventories of HFC consumption and production data, but others had not, and would therefore need more time to report data.

23. One representative said that time had to be allowed for parties to introduce the necessary legislation to regulate HFC consumption and production; in the absence of such regulation, they would have no data to report. Another representative suggested that where legislation had not been promulgated, estimated data could be reported. Some representatives stated that data collection often proved problematic for developing countries, and that they would benefit from assistance and guidelines on how to produce estimates.

24. Introducing the second topic, consideration of the proposed revised data reporting forms and guidelines (UNEP/OzL.Pro.WG.1/39/3), the Co-Chair suggested that it would be more appropriate to conduct a detailed discussion on the proposals in a group rather than in the plenary session. The Secretariat could provide clarification on any issues raised, parties could submit specific suggestions for revision and the Secretariat could issue revised drafts of the forms and guidelines for consideration at the Twenty-Ninth Meeting of the Parties in November 2017.

25. Agreeing with the proposal, one representative nevertheless commented that she had found the proposed new forms to be well designed and easy to complete. One representative observed that the new forms involved minimal changes from the existing forms, which was very helpful, although another stated that there were some important differences for HFCs compared to other substances and that the forms for HFCs should be separate from, but very similar to, the forms for ozone-depleting substances. Other representatives commented that the discussion should be linked to the Secretariat's proposal to introduce online reporting, which would be an extremely useful step forward. Many representatives agreed with the Co-Chair's suggestion that the issues should be discussed in more detail in a small group, with the aim of having final versions of the forms available for consideration by the Twenty-Ninth Meeting of the Parties.

26. Introducing the third topic, the question of reporting of mixtures and blends containing HFCs, the Co-Chair drew attention to the suggestion of the Secretariat (contained in document UNEP/OzL.Pro.WG.1/39/3) that parties should be allowed to report the actual quantities of the mixtures or blends rather than the amounts of the different HFCs contained in them, in recognition of the large volume of blends in use. She suggested that this topic could be taken up in the deliberations of the informal group that already had been proposed.

27. Agreeing to the proposal, one representative said that the reporting of mixtures could also be carried out through an online reporting tool. Several representatives observed that although they did not object to the Secretariat calculating the volumes of pure substances contained in the blends, parties also needed to be able to carry out those calculations themselves, in order to be able to assess their state of compliance and to set the quantities to be included, for example, in annual quotas and licensing systems. One representative suggested that it would be helpful if the Secretariat could make available a dedicated tool to enable parties to carry out such calculations. Agreeing with this proposal,

other representatives suggested that Article 5 parties would also benefit from training and capacity-building.

28. Introducing the fourth topic, the question of trade with non-parties and associated reporting, the Co-Chair explained that under Article 7, parties would be required to report HFC imports from and exports to parties and non-parties as part of their annual reporting obligations, which would take effect from the entry into force of the Kigali Amendment for each party.

29. Several representatives queried the assumption that the reporting of exports of HFCs to and imports from non-parties needed to begin before the entry into force of the trade provisions under Article 4 in 2033, and suggested that clarification and further discussion would be helpful. One representative expressed the view that under Article 4 of the Kigali Amendment, as agreed, in 2033 there should be no reporting requirement under Article 7 of the Protocol and therefore suggested that clarification and further discussion would be useful.

30. In response to requests from several parties that they discuss all four topics in more detail, the Co-Chair suggested, and the Working Group agreed, to establish a contact group to facilitate more detailed discussion of all the issues arising under item 3 on the Kigali Amendment to the Montreal Protocol to phase down HFCs.

31. Reporting back, the co-chair of the contact group said that the group had concluded its discussions on the proposed revised data reporting forms and guidelines and on the reporting of mixtures and blends containing HFCs. A number of parties wished to provide the Secretariat with additional or more comprehensive comments on those two issues, but would be unable to do so at the present meeting. Following consultations with the Secretariat, it had been agreed that parties would be given until 30 August 2017 to submit their comments, thereby allowing the Secretariat sufficient time to review the comments and make any necessary revisions to the reporting forms before the Twenty-Ninth Meeting of the Parties. The Secretariat would send a reminder to parties in that regard.

32. On the issue of the timing of reporting of baseline data, the co-chair of the contact group said the group had discussed the matter and, although it had not been in a position to reach a decision, it had managed to outline some of the key principles to be considered further at the Twenty-Ninth Meeting of the Parties. Discussions had also taken place on the question of trade with non-parties and associated reporting. The co-chair requested that the contact group be permitted to reconvene during the Twenty-Ninth Meeting of the Parties in order to pursue discussions on all the issues under its mandate, including those related to agenda item 3 (a).

B. Work by the Scientific Assessment Panel on updating the global-warming potential of the substances in Group I of Annex A, Annex C and Annex F to the Montreal Protocol (UNEP/OzL.Pro.28/12, para. 204)

33. Introducing the sub-item, the Co-Chair observed that a specific issue to be resolved was the need to decide the GWP of HCFCs produced or consumed by parties in the HCFC baseline years, which was included in the calculation of HFC baseline levels, since some of those GWP figures were missing from Annex C. In addition, there was the question of the appropriate GWP for HCFC-141 and HCFC-142.

34. Mr. Paul Newman, Mr. John Pyle and Mr. Bonfils Safari, three of the four co-chairs of the Scientific Assessment Panel, gave a presentation on the calculation of GWP values, particularly in respect of the GWP of the substances in Annex C and Annex F, and the process of updating those values. A summary of the presentation, prepared by the presenters, is set out in section A of annex II to the present report.

35. All the representatives who took the floor thanked the members of the Scientific Assessment Panel for their hard work. Responding to questions from representatives, Mr. Newman and Mr. Pyle explained that the new study of GWP values of HCFCs referred to in the presentation would be peer-reviewed. Some of the GWP values it included had been calculated many years before, and were simply being updated, but others were entirely new. This was particularly the case for those HCFCs that were not manufactured and could not therefore be observed in the atmosphere; their GWP were calculated from laboratory measurements, models and estimates of their likely lifetimes, based on their molecular structures.

36. Mr. Newman added that the impact of feedback processes and interactions between different substances in the atmosphere had already been included in the calculations of GWP values. He clarified that the Panel was planning to present updated GWP values for all the substances in Annexes A, C and F, and this was of particular importance for those HCFCs which currently had no agreed values.

37. Responding to questions about the level of uncertainty in the calculations, of a suggested 40 per cent, Mr. Newman and Mr. Pyle agreed that this was high, but for most substances the Panel did not expect it to be that significant. The uncertainty stemmed from a series of factors, including, among others, the infrared absorption spectrums of the substances, the atmospheric lifetimes of the substances, projections of future concentrations of other greenhouse gases such as methane, carbon dioxide or water vapour, and likely changes in the absolute GWP of carbon dioxide (as calculated by the Intergovernmental Panel on Climate Change), against which all GWP values were calculated.

38. This uncertainty was not unusual; GWP values calculated by the Intergovernmental Panel on Climate Change had themselves changed on many occasions and would undoubtedly change again in the future. Achieving absolute certainty over GWP values was impossible. This had also been the case for calculations of ozone-depleting potentials, some of which had changed by large amounts, particularly those of short-lived substances, but this had not prevented the parties to the Montreal Protocol from successfully taking action. It should not be assumed, however, that GWP values would change radically; the Panel expected the values for substances that were actually in use to remain about the same.

39. Some representatives pointed out that, notwithstanding the uncertainty levels over GWP values, for the purposes of the parties, the GWP values agreed in the Kigali Amendment, which were based on values included in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, were those that would be used in parties' calculations of baseline and annual consumption and production data.

40. Thanking the co-chairs of the Panel for their presentation and responses to questions, the Co-Chair clarified that the immediate issue was the GWP values for six specific HCFCs for which data had been reported (HCFC-121, HCFC-122, HCFC-133, HCFC-141, HCFC-142 and HCFC-225) but that did not yet have assigned GWP values. She drew attention to the suggestion of the Secretariat (contained in document UNEP/OzL.Pro.WG.1/39/3) that for HCFC-141 and HCFC-142, the parties could consider using the GWP values of HCFC-141b and HCFC-142b, respectively, which were the most commercially viable isomers of each substance. She also observed that under the notes to Annex C of the Kigali Amendment, the default value of zero would apply to substances for which no GWP was indicated until a GWP value could be agreed by means of adjustments. Unless the parties agreed otherwise, a GWP of zero would be assigned to the four remaining HCFCs, and parties could decide in the future whether those values needed to be adjusted.

41. The Working Group agreed to the proposal of the Co-Chair that these issues be discussed further in the contact group to be established under item 3 (a) as agreed.

42. Reporting back, the co-chair of the contact group said that, although progress had been made on the issue of the GWP values of HCFC-141 and HCFC-142, it had not been possible to resolve the matter. The co-chair therefore requested that the contact group be permitted to reconvene during the Twenty-Ninth Meeting of the Parties in order to pursue discussions on all the issues under its mandate, including those related to agenda item 3 (b).

C. Process for approving destruction technologies for substances in Annex F to the Montreal Protocol (Article 2J, paras. 6 and 7)

43. Introducing the sub-item, the Co-Chair drew attention to the background information provided by the Ozone Secretariat in paragraphs 11 to 15 of document UNEP/OzL.Pro.WG.1/39/2.

44. One representative, speaking on behalf of a group of parties, stressed the importance of beginning to address the issue at the present meeting. If they were to be able to act in 2019, parties and enterprises needed to start planning as soon as possible. He therefore suggested that, for the destruction of HFCs, the Meeting of the Parties should approve, on a provisional basis, the use of the existing technologies approved for the destruction of HCFCs. At the same time, the Technology and Economic Assessment Panel could be asked to look into appropriate additional technologies that could then be considered and potentially approved by the parties in 2018. He offered to submit a conference room paper on this issue for further consideration by the Working Group. A number of other representatives expressed their support for the proposal which they deemed to represent a practical interim solution. One representative stressed that consideration of any additional technologies should take into account the incremental capital costs and the incremental operating costs of those technologies.

45. The parties agreed to refer the matter to the contact group set up to discuss all the issues arising under agenda item 3 on the Kigali Amendment to the Montreal Protocol to phase down HFCs.

46. The representative of the European Union subsequently introduced, on behalf of Australia, Canada, the European Union and the United States, a draft decision on destruction technologies with regard to controlled substances. The overall aim of the proposal, he said, was to show that such technologies existed, and to support the investment planning of companies that might wish to put technologies in place now with a view to bringing them on stream before or after 1 January 2019.

47. The Open-ended Working Group agreed to refer the draft decision to the contact group dealing with agenda item 3 on data and destruction technologies for further consideration.

48. Reporting back, the co-chair of the contact group said that the group had discussed, but made no modification to, the draft decision.

49. The Working Group therefore agreed to forward the draft decision, as set out in section A of annex I to the present report, to the Twenty-Ninth Meeting of the Parties for further consideration.

D. Progress by the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol in relation to decision XXVIII/2

50. Introducing the sub-item, the Co-Chair of the Open-ended Working Group recalled that, in paragraph 10 of decision XXVIII/2, the parties had requested the Executive Committee to develop, within two years of the adoption of the Amendment, guidelines for financing the phase-down of HFC consumption and production and to present those guidelines to the Meeting of the Parties for the parties' views and inputs before their finalization by the Executive Committee. The information provided by the Secretariat on the issue (contained in document UNEP/OzL.Pro.WG.1/39/3) provided a summary of the progress made by the Executive Committee in its first two meetings held since the Twenty-Eighth Meeting of the Parties in Kigali; the Committee's third meeting had been held immediately prior to the present meeting of the Open-Ended Working Group. The final reports of all three meetings were available on the website of the Multilateral Fund.

51. The Co-Chair proposed that the Working Group acknowledge and take note of the progress made at the seventy-ninth meeting of the Executive Committee, and looked forward to the full report of the Committee on the progress made in accordance with decision XXVIII/2, which would be submitted to the Twenty-Ninth Meeting of the Parties, in line with the decision. The Working Group agreed to defer consideration of the issue to the Twenty-Ninth Meeting of the Parties.

IV. Replenishment of the Multilateral Fund for the triennium 2018–2020, including the report by the Technology and Economic Assessment Panel (decision XXVIII/5)

52. Introducing item 4 of the agenda, the Co-Chair of the Open-ended Working Group said that, in preparation for a decision by the parties on the replenishment of the Multilateral Fund for the triennium 2018–2020, the replenishment task force of the Technology and Economic Assessment Panel had carried out a study in accordance with the terms of reference set out in decision XXVIII/5. Summary information on that report was contained in document UNEP/OzL.Pro.WG.1/39/2/Add.1.

53. The main findings of the report were presented by Ms. Shiqiu Zhang, Mr. Lambert Kuijpers, and Ms. Bella Maranion, a summary of which, prepared by the presenters, is set out in section B of annex II to the present report.

54. Following the presentation, the presenters of the report responded to specific queries. One representative, noting that funding for HCFC phase-out and HFC phase-down activities had been dealt with discretely in the report, said that in reality there would be interaction between the two components, and asked what implications that would have for the funding and implementation of activities. One representative remarked that it would be useful for the study to take into account the costs for elimination of the remaining consumption of HCFCs in the servicing sector, where there was most opportunity for improvement and considerable need for capacity-building in the management of new refrigerants. Ms. Maranion said that the report recognized that a number of HCFC Phase-out Management Plans (HPMPs) already included activities that addressed the phase-out of HCFCs as well as the phase-down of HFCs under the Kigali Amendment. In that regard, parties should be encouraged to make technology choices that favoured low-GWP or zero-GWP alternatives. In addition, many of the HFC phase-down enabling activities were similar to those undertaken during stage I of the HPMPs, including setting baselines, gathering information, putting in place national strategies, and defining the scope of activities to meet the compliance goals for HFCs. In that regard HPMPs constituted a good vehicle to meet current compliance requirements regarding the phase-out of HCFCs and to initiate enabling activities under the funding mechanism for 2018–2020 for HFC

phase-down. On the other issue raised, Mr. Kuijpers agreed that capacity-building for servicing was very important, either as part of stage II of the HPMPs or as part of enabling activities for HFC phase-down. In response to a query about how the task force evaluated which HCFC phase-down activities were necessary for compliance with the 2020 obligation compared to the activities that might move beyond the current compliance obligation, Mr. Kuijpers said that the planned funding of certain HCFC phase-down activities in the Multilateral Fund's business plan could lead to a reduction in 2018, 2019 and 2020 greater than the 35 per cent mandated under the Protocol. However, the study had not been intended as a mathematical analysis of the compliance level of 35 per cent by 1 January 2020, but had entailed the addition of agreed funding amounts and planned amounts in the business plan to obtain a total for those years; the reduction percentage that resulted varied from 35 per cent to levels that were higher.

55. The Working Group then discussed substantive issues arising from the presentation by the replenishment task force of the Technology and Economic Assessment Panel.

56. One representative said that funding continued to be the cornerstone of the success of the Montreal Protocol, and continued financial support was necessary to assist Article 5 parties in fulfilling their implementation obligations. While the phase-out of HCFCs continued to be the funding priority in the coming triennium, the Fund would need to assist Article 5 parties to take initial steps to phase down consumption and production of HFCs pursuant to the Kigali Amendment. It was also important that the phase-out of HCFCs avoided the introduction of high-GWP HFCs that needed to be phased down later. Another representative said that the fact that funding had already been approved that would help parties phase out around 59 per cent of the global HCFC consumption baseline represented a significant achievement, and would serve as a strong basis for the next phase in helping Article 5 parties meet their obligations both for ozone-depleting substances and for the new Annex F substances.

57. One representative highlighted the daunting challenges still facing many developing countries in the implementation of stage II of their HPMPs, including the particular difficulties experienced by small and medium-sized enterprises, and the obstacles to the introduction of low-GWP alternatives, including market acceptance and safety standards. The funding requirements of the production sector deserved particular attention in developing countries, including with regard to the manufacture of HCFC-22 and the consequent emission of HFC-23 by-product, and the need to resolve the issue of funding for the closure of swing plants. Another representative expressed concern that the assurances of sufficient additional and sustainable funding under the Kigali Amendment might be slow to materialize, jeopardizing the ability of Article 5 parties to achieve their goals.

58. The representative of Japan said that his country needed to ratify the Kigali Amendment in order to make a contribution to the Multilateral Fund for the HFC-related funding component. In the meantime, the separate calculation of costs related to HCFC phase-out and HFC phase-down, as in the report of the replenishment task force, was needed to enable donors to accurately assess their contributions in each category. Another representative said that, as the financial needs of the Multilateral Fund differed from year to year, consideration might be given to replacing the current system of funding whereby annual assessed contributions from non-Article 5 parties remained the same over the three-year replenishment period with one whereby the total contribution remained the same but annual payments could vary in accordance with expected annual costs.

59. Several representatives pointed to certain aspects of the study that required further attention. One representative said that the report had not adequately responded to paragraph 3 of the terms of reference adopted under decision XXVIII/5, which requested the Technology and Economic Assessment Panel to provide indicative figures of the resources within the estimated funding for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives. Now that HFCs were controlled under the Montreal Protocol, it was important for parties to keep track of the additional funding that would be provided to avoid HFCs, as that would contribute to reducing the HFC baselines of Article 5 parties.

60. A number of representatives said that further analysis and quantification of the cost estimates were needed. One representative said that some of the cost items in the estimated funding requirement were not well justified, such as funding for additional HCFC phase-out demonstration projects, several of which had already been funded by the Multilateral Fund. In addition, there was uncertainty over the cost estimates for mitigating emissions of HFC-23 from HCFC-22 production facilities, and estimated funding for that had not taken into account the fact that some Article 5 parties already had in place programmes to destroy HFC-23. Another representative also noted that some of the funding parameters were uncertain, with the replenishment task force providing a relatively wide range to work from. In addition, while the study had considered business plan amounts for stage II of the HPMPs,

those figures often diverged from reality, as many projects were approved at less than the business plan estimates. Yet another representative said that the business plan developed by the Multilateral Fund was not equivalent to an assessment of funding to meet compliance obligations under the Protocol. In the report, however, the analysis had not been explicitly limited to only those business planning funds needed to meet the incremental costs of compliance, and estimates could be refined in that regard.

61. Another representative, speaking on behalf of a group of parties, said that some of the assumptions and methodologies of the study required clarification, and recent decisions of the Executive Committee indicated a need to update estimates. In addition, in some sections of the report the distinction between the costs for HCFC-related activities and those for HFC-related activities was not clear. While recognizing the difficulties of the replenishment task force in developing their costings, she also said that it would aid an understanding of the figures provided if the cost-effectiveness of different types of activities were indicated in the report, in both ODP-tonnes and CO_2 equivalent.

62. One representative said that the linkages between HCFC phase-out and HFC phase-down should be maintained in all elements of planning, included financing, scheduling, baseline calculation and reporting.

63. The Working Group agreed to establish a contact group to discuss the issue further.

64. Reporting back, the co-chair of the contact group said that after several lengthy meetings the group had been able to conclude its discussions on all the issues for possible consideration by the Technology and Economic Assessment Panel in a supplementary report on replenishment for the triennium 2018–2020, with one exception. The issues were listed in a non-paper dated 13 July 2017, which was available on the meeting portal. The one exception was a potential request to the Panel to look into the costs associated with energy efficiency while phasing down HFCs for indicative funding requirements for the trienniums 2021–2023 and 2024–2026, related to chapter 9 of the Panel's report.

65. A number of representatives explained that the disagreement arose from the inclusion of a reference to decision XXVIII/2 in the clause about energy efficiency, which had been proposed. Some representatives felt that this reference was not necessary, while others argued that without the reference the clause was too wide in its coverage; decision XXVIII/2, which had been adopted in Kigali, set the terms of reference for the study, and should be adhered to.

66. After further discussions in the margins of the meeting, representatives suggested that the entire section on chapter 9 in the contact group's list of issues should be deleted. The Working Group agreed to the proposal, and with that amendment the list of issues, as set out in annex III to the present report, without formal editing, was forwarded to the Technology and Economic Assessment Panel for its consideration.

V. Technology and Economic Assessment Panel 2017 report (volumes I and II), including related issues

67. Introducing item 5 of the agenda, the Co-Chair of the Open-ended Working Group drew attention to volumes 1 and 2 of the 2017 report of the Technology and Economic Assessment Panel, containing the Panel's progress report for 2017 and its critical-use nominations report, respectively.

68. Following a general introduction by the co-chair of the Panel, Mr. Ashley Woodcock, members of the Panel and its technical options committees summarized the findings of the report as follows: Mr. Paolo Altoe – Flexible and Rigid Foams Technical Options Committee; Mr. Adam Chattaway – Halons Technical Options Committee; Mr Roberto Peixoto – Refrigeration, Air-Conditioning and Heat Pumps Technical Options Committee; Ms. Helen Tope – Medical and Chemicals Technical Options Committee; and Mr. Mohammed Besri, Mr. Ian Porter and Ms. Marta Pizano – Methyl Bromide Technical Options Committee. In addition, Mr. Daniel Verdonik reported on the work undertaken by the Panel in response to decision XXVIII/8, on the phase-out of HCFCs, in order to update the Panel's assessment report on the issues related to the HCFC phase-out, which had originally been prepared in response to decision XXVII/5. Lastly, Ms. Marta Pizano briefly summarized the administrative issues faced by the Panel.

69. A summary of the presentations, as prepared by the presenters, is set out in section C of annex II to the present report.

70. In the ensuing discussion, panel members responded to questions, a number of which related to methyl bromide, including some regarding the discrepancy reported by the Panel between emissions from reported consumption and emissions based on atmospheric concentrations. On that topic,

Mr. Porter said that the Panel did not know the source of the discrepancy, but would continue to work with the Scientific Assessment Panel to monitor the situation as closely as possible. He noted that stocks were not reported under Article 7, but that parties might wish to consider requesting such reporting. Furthermore, he recalled that under Article 7 parties had the obligation to report methyl bromide uses, whether controlled or not. He characterized the tracking of methyl bromide by parties as a key challenge that could lead to differences and errors in the categorization of methyl bromide uses, and he advised parties that had good monitoring processes to consider helping those that did not. Parties sometimes had difficulty understanding which applications were considered to be critical-use or quarantine and pre-shipment applications, and how to monitor such uses or even to locate them. In that regard, the Panel would provide references for inclusion in the report to clarify which categories fell under which definition. Some parties noted their concern with the analysis provided by the Panel in relation to this issue and suggested that its analysis should be confined to its technical mandate. Addressing the question of why methyl bromide recapture systems were not being used, Mr. Porter said that they were in fact being used, albeit at a very low level. Recapture was seen to impose a cost on the recovery of methyl bromide, so that the systems tended to be successfully used in areas where their use was legislated. Furthermore, while the systems recaptured all the methyl bromide emitted, they stripped some of the product. Nevertheless, such systems were available, and were improving all the time, and the Panel's report included an overview of recapture technologies. Lastly, on the subject of charcoal rot, Mr. Porter noted that the fungus, *Macrophomina phaseolina*, had previously been a weak pathogen but with the phase-out of methyl bromide had become a major one. Although some areas, including Italy and California, had programmes to address it, the fungus was an issue of concern to the Panel.

71. A number of representatives sought clarification regarding the Panel's suggestion that the parties request it to form a working group with representatives of the International Civil Aviation Organization (ICAO) and about the expected output and procedural aspects of such an arrangement. Mr. Verdonik recalled that the parties had previously requested the Ozone Secretariat and ICAO to work together to arrive at an agreement and an action plan to move forward on the replacement of halons in civil aviation, which after 13 years had led to an agreement to establish a replacement date for every single halon application. The replacement applied only to new designs, however, and the Panel was concerned that halon would run out long before civil aviation stopped needing it, which would cause major problems as an aircraft could not fly without halon according to ICAO rules. The idea behind the establishment of a joint working group was that ICAO contacts and mechanisms be used to determine the actual quantities of halon installed on aircraft and emitted, in order to develop a clearer picture of the situation in civil aviation.

72. On the subject of HCFC servicing needs, one representative noted that two years earlier her country had identified a need for HCFC Blend A in flooding uses, particularly in small vessels, and asked whether any similar uses had been identified. In response, Mr. Verdonik said that nothing additional had been found despite direct questions being posed to the manufacturer, and proposed to discuss the matter bilaterally with the representative on an informal basis. With respect to another question regarding applications for HCFC Blend B, he indicated that the Panel had based its assessment on the use of the substance as a replacement for halon 1211 in aircraft rescue and fire-fighting services, although it was also used in computer rooms and other applications.

73. In response to a question regarding whether the Panel had considered the use of approved destruction technologies for ozone-depleting substances in relation to HFC-23 destruction, Ms. Tope said that any such evaluation would require a decision to that effect by the parties. She noted, however, that many ozone-depleting substance destruction technologies would likely be applicable to HFC, in particular plasma-based technologies and thermal and incineration technologies, with the high temperatures used breaking down HFCs. She cautioned, however, that not all the approved technologies would necessarily be equally applicable; in particular, processes designed to break down CFCs, HCFCs or halons chemically might not be suited to the different chemical properties of HFCs. A technical review would therefore be required to evaluate the destruction technologies on a case-by-case basis.

74. One representative drew attention to recent reports of the significant negative impact of dichloromethane on ozone layer recovery and asked whether the Panel had any information on the substance and whether it would be addressed in the Panel's 2018 report. Ms. Tope noted that dichloromethane, also known as methylene chloride, was not a controlled substance. It was used as an industrial and pharmaceutical solvent and in chemicals production. The Medical and Chemicals Technical Options Committee had reported on dichloromethane in the Panel's 2014 assessment report, which had indicated that the HFC-32 production feedstock use reported on in a recent article was a relatively minor source of dichloromethane emissions globally. The Panel could continue to work with the Scientific Assessment Panel to develop a better understanding of the issue and report back in its

2018 report if the parties so decided. At the request of the Co-Chair, Mr. Pyle provided additional information on dichloromethane. He began by noting that the Scientific Assessment Panel, in its reports over the past decade, had discussed very short-lived compounds with a particular focus on brominated compounds that could have an impact on the stratospheric ozone layer. Recently, however, the attention of the scientific community had shifted to include chlorinated short-lived species. Recent reports indicated that atmospheric concentrations of dichloromethane had doubled over the past decade, corresponding to a growth rate of about 8 per cent per year. Indications were that emissions were in the order of one teragram of dichloromethane per year, a figure that was larger than that for emissions of chlorofluorocarbon in the 1980s. The questions of where the current emissions were coming from and whether they were likely to increase were of interest to the Scientific Assessment Panel and within the scope of the Technology and Economic Assessment Panel's particular expertise.

75. Responding to requests for information on another substance, 2-bromotrifluoropropene (2-BTP), Mr. Chattaway described it as a bromine-containing molecule but with a carbon-carbon double bond, which gave it a short atmospheric lifetime that could be measured in days. Given that short atmospheric lifetime and the fact that under normal release it did not reach the stratosphere, 2-BTP had a very low ozone-depleting potential of 0.0028 and a global warming potential of 0.26 on the United States Environmental Protection Agency's Significant New Alternatives Policy (SNAP) list. In terms of its uses, 2-BTP was currently approved for aviation fire extinguishers, where it was in the process of replacing halon 1211, and as a total flooding agent in non-occupied areas, and had been considered for aircraft engine nacelles. The manufacturer was also seeking approval for its use in other applications. Because it was not yet in full-scale commercial production, however, the economics of 2-BTP were not yet clear.

76. Responding to a question on the essential-use exemption for China, Ms. Tope indicated that the Panel had received from the party the information it required and had taken that information into account in assessing the nomination for 2018. With respect to information requests for 2018 essential-use nominations in general, she said that the information was only needed for essential-use nominations received in 2018, except in the case of information on China's progress with its studies on the purification of tetrachloroethylene and the associated required reagent stability, which had been requested for September 2017 in order to support a recommendation to be considered at the Thirtieth Meeting of the Parties.

A. Nominations for essential-use exemptions for 2018

77. Introducing the sub-item, the Co-Chair drew attention to paragraph 31 of document UNEP/OzL.Pro.WG.1/39/2, paragraphs 12 and 13 of document UNEP/OzL.Pro.WG.1/39/2/Add.1, and sub-section 5.2 of the May 2017 progress report of the Technology and Economic Assessment Panel.

78. In relation to her country's request for an essential-use exemption, the representative of China thanked the Medical and Chemicals Technical Options Committee for its work. She explained that, over the past few years, China had been carrying out research with a view to solving the issue, as the party wished to cease its requests for essential-use exemptions as soon as possible. Progress had been achieved in that research in relation to the purification of tetrachloroethylene as the alternative to carbon tetrachloride. It was to be hoped that, through further efforts, the country would be able to improve the precision of the testing in order to meet the country's standard HJ 637-2012. By the end of 2017 or the beginning of 2018 at the latest, once that research had been further conducted, China would submit the progress on the purification of the tetrachloroethylene as the alternative and a timeline would be studied accordingly.

79. In response, one representative, speaking on behalf of a group of parties, said that he wished to hold discussions with the representative of China and the Committee to seek further clarification relating to the preparation and publication of a revision to standard HJ 637-2012 in 2018 and to be able to understand fully the various information requirements set out by the Committee in the report of the Technology and Economic Assessment Panel, and the related timelines, to ensure that any information that had to be provided prior to the final nomination would be forthcoming.

80. One other representative expressed the wish to join in the consultations. Another representative pointed out that, while China had made the only request for 2018 and was aiming to cease such requests, that did not preclude other countries from making requests in the future if their circumstance so dictated and also expressed an interest in joining the consultations.

81. Subsequently, the representative of China introduced a draft decision set out in a conference room paper and, later, following further consultations, a revised version of that draft decision. One element remained in square brackets, as she still needed to consult with the relevant bodies in her

country with regard to the schedule for completion of the revision of the relevant national standard. She said that she would do so before the Twenty-Ninth Meeting of Parties.

82. The Working Group therefore agreed to forward the draft decision, as set out in section B of annex I to the present report, to the Twenty-Ninth Meeting of the Parties for further consideration.

B. Nominations for critical-use exemptions for 2018 and 2019

83. Introducing the item, the Co-Chair of the Working Group referred representatives to the interim recommendations of the Methyl Bromide Technical Options Committee on the critical-use nominations put forward by parties (contained in volume 2 of the Technology and Economic Assessment Panel's report and summarized in paragraph 32 of document UNEP/OzL.Pro.WG.1/39/2 and paragraphs 14 and 15 of the addendum thereto (UNEP/OzL.Pro.WG.1/39/2/Add.1). He noted that the nominating parties would be conducting bilateral discussions with the Committee, and the final recommendations would be considered by the Twenty-Ninth Meeting of the Parties, in November 2017, based on the final report of the Committee.

84. All the representatives who took the floor thanked the Technology and Economic Assessment Panel and its Methyl Bromide Technical Options Committee for their hard work. The representative of Canada nevertheless stated that she was disappointed that the Committee had been unable to assess the Canadian nomination, in particular because, in her delegation's view, significant omissions had been made by the Committee in its summary of the situation in Canada. The Committee's report did not include the progress made in developing a research programme to test the feasibility of using grow bags to grow strawberry runners, even though the results of the programme's first year had been submitted to the Committee before its meeting in March 2017. Its information on the use of chloropicrin was incorrect; the substance was not used in Prince Edward Island, where the strawberry runners were grown, since the federal authorities had found that the chemical had the potential to contaminate groundwater, and were therefore not issuing permits, and it was also not used in other Canadian provinces. It was her delegation's view that the lack of available alternatives in Prince Edward Island, together with the ongoing research programme, satisfied the criteria for a critical use set out in decision IX/6. Her delegation was requesting a bilateral meeting with the Committee to further discuss these issues, in the hope that full information on Canada's research programme and legislation would be included in future reports, allowing both the Committee and the Parties to fully assess the merits of the nomination.

85. The representative of Australia queried the Committee's recommendations for a reduction of 20 per cent in the dosage rate of methyl bromide in response to his country's critical-use nomination for strawberry runners for 2019. He observed that, as even the Committee itself had noted, previous research efforts had not been able to demonstrate equal efficacy of the reduced dosage in the growing area in question. The growers would be keen to apply the lower rate in order to save costs, but were not doing so not because of regulatory over-reach but because the lower dosage was ineffective. His delegation rejected the Committee's opinion that continued approval of critical-use exemptions had led to complacency in the search for alternatives to methyl bromide; he pointed to the employment of a full-time researcher, and the other resources made available from the growers themselves, for the research programme, together with the development of world-class research on alternatives such as methyl iodide and steam disinfestation, as disproving that statement. His delegation was prepared to provide additional information to the Committee and looked forward to the opportunity to discuss the matter further in bilateral discussions with the Committee.

86. The representative of South Africa said that her delegation accepted the recommendation of the Methyl Bromide Technical Options Committee in response to the critical-use nomination for the use of methyl bromide in mills of her country, which had made real progress in reducing both dosage rates and the frequency of fumigation. In respect of the Committee's recommendation in response to the critical-use nomination for structures, however, the danger of damage from wood borers was very real, and she expressed the wish therefore to conduct further bilateral discussions with the Committee.

87. The representative of the European Union observed that the Union had been able to phase out methyl bromide completely in 2010, and had managed to deal successfully with specific challenges since then by using alternative substances. As the Methyl Bromide Technical Options Committee had pointed out in its report, many alternatives were now available. He congratulated China on the implementation of its national management strategy, which would enable it to end its use of methyl bromide in 2019. The adoption of such strategies had been recommended in decision Ex.I/4, on conditions for granting and reporting critical-use nominations for methyl bromide, and he encouraged all parties using methyl bromide to introduce such strategies, and also to review any existing legislation which might mandate the use of methyl bromide. While accepting the argument of Australia that a lower dosage rate might not be applicable in all circumstances, he nevertheless urged

its implementation wherever possible. He expressed the hope that any draft decision that might be discussed could continue to apply gentle pressure to parties to continue their efforts to phase out methyl bromide, and indicated his willingness to participate in any discussions on such a decision.

88. The representative of China said that her delegation accepted the recommendations of the Methyl Bromide Technical Options Committee in respect of her country's critical-use nomination. The considerable efforts her country had made in respect of research, registration and the promotion of alternatives had enabled it to implement its national management strategy on schedule, and China would not submit any further nominations for methyl bromide critical-use exemptions.

89. The Co-Chair encouraged all interested parties to arrange bilateral meetings in the margins of the meeting with the Methyl Bromide Technical Options Committee to discuss its recommendations in more detail. Those bilateral meetings were expected to continue after the current meeting and the Committee would produce a final report on the evaluation of the nominations taking into account additional information provided by the nominating parties. Parties would return to the topic at the Twenty-Ninth Meeting of the Parties in November 2017.

90. The representative of Australia offered to draft a conference room paper on the matter for submission to the Twenty-Ninth Meeting of the Parties.

C. The phase-out of hydrochlorofluorocarbons (decision XXVIII/8)

91. Introducing the item, the Co-Chair of the Open-ended Working Group drew attention to the information contained in the report of the Technology and Economic Assessment Panel (volume 1, chapter 7) and summarized by the Secretariat (UNEP/OzL.Pro.WG.1/39/2/Add.1) on the amounts of HCFCs that might be needed after 1 January 2020 for essential uses in non-Article 5 parties, servicing requirements for refrigeration and air-conditioning equipment and other sectors in non-Article 5 parties, and the basic domestic needs of Article 5 parties.

92. The representative of the United States introduced a conference room paper containing a draft decision, submitted by Australia, Canada, Japan and the United States. Given that the start of the HCFC servicing tail period for non-Article 5 Parties, in 2020, was not far off, he believed that parties would need to agree an appropriate path forward in the near future. He also noted that the Halons Technical Options Committee had considered that there was a possible need for the continued use of HCFCs in aircraft rescue and firefighting applications after 2020, and that, similarly, the Medical and Chemicals Technical Options Committee had identified a possible need for HCFCs used as solvents after 2020. The purpose of the draft decision was therefore to request the Technology and Economic Assessment Panel to assess non-Article 5 parties' requirements for HCFCs between 2020 and 2030, and beyond, for use in fire suppression sectors, as solvents and in other possible niche uses. The draft decision invited parties and other interested entities to submit relevant information to the Secretariat by 31 December 2017 and requested the Panel to produce its report by 1 March 2018. This was a deliberately early date, he explained, because any adjustment to the Protocol needed to be submitted at least six months in advance of the Meeting of the Parties at which it was to be considered. Although he was not prejudging the conclusions of the assessment, some potential policy outcomes might require such an adjustment.

93. The representatives of Australia, Canada and Japan also spoke in support of their proposal for a draft decision. The representative of Australia expressed appreciation for the careful work of the Technology and Economic Assessment Panel in preparing its report, and agreed with its conclusion that no production of HCFCs for the basic domestic needs of Article 5 parties would be needed after 2020. She also drew attention to the Panel's conclusion that there might be a need for essential-use exemptions for HCFCs in refrigeration and air-conditioning equipment and laboratory and analytical uses after 2020, and that that would require an adjustment to the Protocol. The representative of Canada said that the use of HCFCs for servicing after 2020 was built into her country's phase-out schedule, to avoid the need for the premature retirement of equipment. She also commented that she believed that there might be a need for the use of HCFCs in laboratory and analytical uses after 2020, which would require an essential-use exemption. The representative of Japan explained that his country had identified a continued need for HCFCs for servicing after 2020.

94. Another representative, welcoming the report of the Technology and Economic Assessment Panel, nevertheless stated his disagreement with the suggestion that HCFCs used as solvents could be added to the list of process agents; the parties had successfully reduced the number of process agents on the list and he expressed the wish to see that progress continue. He agreed with the Panel that there was no need for production of HCFCs for the basic domestic needs of Article 5 parties, and wondered whether there was a need for essential-use exemptions for any consumption of HCFCs other than for

laboratory and analytical uses. Expressing appreciation of the draft decision, he stated his enthusiasm for discussing it further with interested parties.

95. Another representative, however, suggested that there might be a case for a wider range of essential-use exemptions. Parties needed to be very careful not to impose unreasonable restrictions on industry through the application of bans or prohibitions. He would appreciate the opportunity to consider the draft decision further after the meeting and resume the discussion at the Twenty-Ninth Meeting of the Parties.

96. Thanking all those who had contributed to the discussion, the representative of the United States recognized that parties had not yet had sufficient time to consider the proposal fully. He stressed the fact that the draft decision did not prejudge any policy outcomes; it simply aimed to ensure that any future discussion of such outcomes was fully informed. He stressed his willingness to engage in dialogue with any interested representatives.

97. The Co-Chair encouraged all parties to conduct discussions in the margins of the meeting and report back on their deliberations later in the meeting.

98. Subsequently, the representative of the United States reported that additional discussions had been held but that agreement on the final text of the draft decision had not yet been reached.

99. The Working Group agreed to forward the draft decision, as set out in section C of annex I to the present report, to the Twenty-Ninth Meeting of the Parties for further consideration, on the understanding that additional discussions would take place among interested parties during the intersessional period.

D. Organizational and other matters, including process agent uses and key messages from the Technology and Economic Assessment Panel

100. Introducing the sub-item, the Co-Chair drew attention to paragraphs 22 to 34 of document UNEP/OzL.Pro.WG.1/39/2/Add.1 and the relevant sections of the May 2017 progress report of the Technology and Economic Assessment Panel.

1. Organizational and other matters

101. One representative, speaking on behalf of a group of parties, drew attention to the matrix of required expertise in annex 4 to the Panel's report, highlighting the need to attract new expertise to the technical options committees.

102. Two representatives encouraged those technical options committees that had three co-chairs to move to the usual structure of two, as per the committees' terms of reference, taking advantage of the upcoming ends of mandate to effect the change. The exception expressed was for the Medical and Chemicals Technical Options Committee, which might need to retain the three-co-chair set-up in the short term, owing to its recent reorganization. One representative communicated his country's intention to request the renewal of Mr. Sergey Kopylov as Co-Chair of the Halons Technical Options Committee.

103. One representative expressed support for the efforts being undertaken by the Technology and Economic Assessment Panel to plan for the future needs of the body, and encouraged the Panel to continue consulting the parties in that regard.

2. Process agent uses

104. Two representatives, one speaking on behalf of a group of parties, highlighted the great progress being made with respect to process agent uses. One recalled that, at one time, there had been 44 listed process agent uses, that that number had been reduced to the present 14 and that the proposal was now to remove three more. He highlighted that controlled ozone-depleting substances were being used as process agents in facilities that had made very large capital investments and were producing very valuable commodities. The other representative said that the fact that certain uses were no longer being reported was also invaluable from a policy point of view indicating that those parties had eliminated those process agent uses and showed industrial partners where investments should be made in the future to continue the adoption of alternatives. The representative speaking on behalf of a group of parties stated his intention to submit a conference room paper on the issue of process agents, based on paragraphs 29 to 33 of document UNEP/OzL.Pro.WG.1/39/2/Add.1, for consideration by the Working Group.

105. One representative cautioned against narrowing future options through unnecessary modification of the instruments of the Montreal Protocol, especially when some of the volumes of controlled substances being used were extremely small.

106. The representative of the European Union subsequently introduced the aforementioned conference room paper, containing a draft decision. One representative said that he had some comments and minor corrections to suggest, while another representative sought additional clarification in relation to the presence of carbon tetrachloride in the list of uses of controlled substances as process agents. The representative of the European Union agreed to engage in bilateral discussions with the two representatives concerned.

107. Following the informal consultations, the representative of the European Union introduced a revised draft decision.

108. The Working Group agreed to forward the draft decision, as set out in section D of annex I to the present report, to the Twenty-Ninth Meeting of the Parties for further consideration.

3. Other key messages

109. Two representatives expressed their wish to explore further, in the margins of the meeting, the proposal by the Halons Technical Option Committee on cooperation with ICAO.

110. Two representatives stressed the importance of ensuring full and accurate reporting on methyl bromide under Article 7 of the Montreal Protocol, including for quarantine and pre-shipment uses. One of them, speaking on behalf of a group of parties, recalled that all uses of methyl bromide, whether they were controlled or not, had to be reported.

111. Two representatives referred to the methyl bromide atmospheric chart and possible changes to the natural emissions base as a result of climate effects. They felt that the issue required examination, with one questioning whether the information was sufficient and the timescale long enough to enable conclusions to be drawn. Furthermore, he considered the Scientific Assessment Panel the most appropriate body for dealing with the matter and expressed surprise that such a chart had been included in a report by the Technology and Economic Assessment Panel. The Panel was a technical body, yet parties were seeing a proliferation of policy-based recommendations emanating from it. The role of the Panel was to provide the information required by the parties so that parties could make policy decisions.

112. One representative pointed out that there was little more information in the report about the discrepancy, identified by Methyl Bromide Technical Options Committee, between top-down and bottom-up comparisons of emissions and production and consumption, than that which appeared in the executive summary. She also stressed that, although the Committee suggested that there was a trend of increased methyl bromide consumption, it appeared to her delegation that there was downward trend, overall, despite individual year increases, and that the work of the parties was continuing to meet expectations.

113. In relation to quarantine and pre-shipment uses, although one representative, speaking on behalf of a group of parties, welcomed the offer by the Methyl Bromide Technical Options Committee to provide further explanations and definitions in relation to the issues of quarantine and pre-shipment, another representative considered the parties already to have provided clear definitions in decision VI/11 and, in a subsequent decision, also to have defined the time period for pre-shipment application as 21 days prior to shipment. Another representative suggested looking more closely at whether parties were applying those definitions.

114. One representative highlighted a potential discrepancy between the information on emissions of carbon tetrachloride contained on two different pages of volume 1 of the Technology and Economic Assessment Panel's progress report, and stressed the need to continue to look at emissions of ozone-depleting substances at future meetings.

115. Subsequently, a representative reported that informal discussions had taken place, during which the co-chairs of the Halon Technical Options Committee had provided additional information. The Working Group agreed that the matter would be taken up again at the Twenty-Ninth Meeting of the Parties.

VI. Safety standards relevant to low-global-warming-potential alternatives (decision XXVIII/4)

A. Results of the workshop on safety standards relevant to the safe use of low-global-warming-potential alternatives

116. Mr. Stephan Sicars (UNIDO), speaking on behalf of the rapporteurs of the workshop on safety standards relevant to the safe use of low-GWP alternatives, presented the summary of the workshop held on 10 July 2017, as set out in document UNEP/OzL.Pro.WG.1/39/4.

117. While thanking the Secretariat for organizing the workshop, all participants for taking part, and Mr. Sicars for presenting the summary, one representative nevertheless expressed his concern over some aspects of the summary and said that he could not endorse it. He disagreed with some of the messages that seemed to emerge from the summary, in particular that the parties to the Montreal Protocol should interfere in the work of other organizations, such as standard-setting bodies, and encourage them to accelerate their work. He asked who would then be responsible for the consequences if safety standards should prove inadequate. He emphasized the importance of such liability issues as well as the increased safety risks in countries with high ambient temperature conditions. He expressed the view that any new safety standards should be at least as good as, and preferably better than, the standards they replaced in ensuring safety. He had found the workshop to be a very worthwhile event, but did not find the summary thereon to be satisfactory.

118. Agreeing with those observations, other representatives also highlighted the need to provide support to Article 5 parties in setting new standards in the process of implementing the provisions of the Kigali Amendment. The protection of consumers was of paramount importance, and further technical work was needed to ensure high standards of safety for the use of new alternatives, particularly in high-ambient-temperature countries.

119. Responding to the comments, Mr. Sicars clarified that it was up to the parties to decide what actions to take in response to the workshop and its results. He noted, however, that it had certainly not been his intention to imply that any pressure should be applied to standard-setting bodies; he had meant, rather, that it would be helpful if those bodies understood that the implementation of the Kigali Amendment was under way, which could help them prioritize their future work. He agreed that the issue of liability was an important one, and that it had been repeatedly raised in the workshop; the summary reflected the recognition that it had to be taken into account in the process of setting new standards. He also observed that the report contained the explicit statement that any risks associated with the use of alternative low-GWP refrigerants should not be higher than the risks implied in current standards, and that this should be a guiding principle in the development of standards.

120. In closing, the Co-Chair observed that a general discussion on future action would be held after the presentation of the report of the Technology and Economic Assessment Panel under item 6 (b).

B. Report by the Technology and Economic Assessment Panel on safety standards

121. The Co-Chair drew attention to paragraphs 43 to 46 of document UNEP/OzL.Pro.WG.1/39/2, paragraphs 35 to 41 of, and annex III to, document UNEP/OzL.Pro.WG.1/39/2/Add.1, document UNEP/OzL.Pro.WG.1/39/INF/4 and volume 3 of the May 2017 report of the Technology and Economic Assessment Panel. She then invited a representative of the Panel to present its report on safety standards.

122. The summary of the presentation of the Co-Chair of the Refrigeration, Air-Conditioning and Heat Pumps Technical Options Committee, Mr. Fabio Polonara, is set out in section C of annex II to the present report.

123. In the ensuing discussion, one representative said that, while he recognized that the parties had requested the Technology and Economic Assessment Panel to liaise and coordinate with standards organizations and to produce its report, he was concerned that such work, especially if it entailed intervening in the work of those organizations, fell outside the Panel's purview insofar as it was not technical or scientific. Neither, he said, was the issuing of policy recommendations, such as the recommendation for the accelerated revision of national standards and regulations to facilitate the use of alternatives with low GWP which also happened to be flammable. In that respect, he highlighted that the use of such flammable refrigerants was more problematic in countries with high ambient temperatures, and he asserted that new safety standards should be at least as strict as those already in

place, if not more stringent; any increase in risk was unacceptable. He also raised the issue of liability in the event that accidents occurred.

124. In relation to the importance of experts participating in drafting committees for the development of new standards, another representative underlined that experts from Article 5 parties were not very well represented. He welcomed the Panel's recommendation on the training and education of technicians, but suggested that more involved, national capacity-building for trainers was required, particularly in low-volume-consuming counties; he proposed that there be subsidies for such activities.

125. In response to a concern expressed by two representatives about the lack of provision for awareness-raising among the general population, and the potential for accidents among end-users to affect the uptake of flammable alternatives, Mr. Polonara explained that safety standards were conceived to ensure that the equipment available for use by the general population was free from any risk. Indeed, people should be able use new domestic refrigeration equipment using flammable refrigerants in exactly the same way as they had used such domestic refrigeration equipment in the past, and therefore do so without training; the potential risks were for the personnel involved in the manufacturing, servicing and end-of-life of the equipment, hence the need to train technicians.

126. During the discussion on the matter, many of those who took the floor, including one speaking on behalf of a group of parties, thanked the Panel for its report on safety standards, saying it contained an elaborate analysis, many practical suggestions and interesting recommendations. One representative said that there was nevertheless room for additional discussion that she hoped could take place in the margins of the current meeting, and another, speaking on behalf of a group of parties, questioned the technological neutrality of chapter 6 of the report, and asked whether the Panel could provide a better indication of where extensive technical restrictions were important in different subsectors, particularly in split air-conditioning.

127. A number of representatives also expressed appreciation for the workshop on the safety standards relevant to the safe use of low-GWP alternatives to HFCs held earlier in the week, on 10 July, although two noted that it had been held in English only, limiting their ability to participate.

128. A number of representatives, including one speaking on behalf of a group of parties, acknowledged the need to update the current safety standards in preparation for the HFC phase-down. Two of them, including one speaking on behalf of a group of parties, said that the current standards posed a barrier to the adoption of climate-friendly alternatives. Several called for rapid action, including one who recalled that decision XXVIII/4 urged countries to finish developing new standards, harmonizing existing standards and revising current standards by the end of 2018. One representative, however, said that sufficient time should be allowed for the development of standards, particularly as they were needed not only for the chemicals themselves but also for the related equipment and maintenance, and the process should not be rushed at the risk of endangering end-users.

129. Many representatives, including one speaking on behalf of a group of parties, underscored the importance of ensuring the highest possible level of safety, including one who cautioned against the temptation to ease standards in order to make more alternatives available. Two representatives, including one speaking on behalf of a group of parties, also highlighted the need for technological neutrality in the development of standards, and two, including one speaking on behalf of a group of parties, said that standards for all technologies should incorporate a risk assessment approach. One representative also stressed that the issue of liability had to be very clear at every step in the standard development process.

130. A number of representatives, including one speaking on behalf of a group of parties, also recognized that international standards had to be adapted at the national level to suit local conditions. Several, including one speaking on behalf of a group of parties, reiterated the need of countries with high ambient temperatures for safety standards that reflected very specific conditions.

131. A number of representatives highlighted the importance of training and capacity-building for the proper application of safety standards, with two stressing the particular needs of Africa owing to the strong presence of an informal sector.

132. There was also some discussion on the notion of the regular consultations with the relevant international standards bodies, as called for in decision XXVIII/4. One representative was keen to see the Secretariat take action on that front, but another representative, speaking on behalf of a group of parties, suggested that effective participation by the Secretariat in the various relevant standard-setting bodies was difficult to achieve. Several representatives cautioned that the development of standards was outside the mandate of the Protocol, although a few allowed that an exchange of information with

the standard-setting bodies could be beneficial. One suggested that the consultations could be structured along the same lines as previous similar activities undertaken with ICAO.

133. Lastly, one representative, speaking on behalf of a group of parties and supported by another representative, suggested that an overview table listing the various standards and their status, updated on a regular basis, would be good means of keeping the parties informed on the progress of safety standards.

134. Following the discussion, a representative of the International Electrotechnical Commission (IEC) drew attention to an online public commenting platform where experts, including those from developing countries, could comment on draft IEC standards without having to travel to meetings, and invited ozone managers to participate in the platform. She also drew attention to the IEC Affiliate Country Programme, according to which participating developing countries were able to adopt 200 different IEC standards nationally free of charge.

VII. Energy efficiency (decision XXVIII/3)

135. Introducing item 7 of the agenda, the Co-Chair of the Open-ended Working Group recalled that by decision XXVIII/3 the parties had requested the Technology and Economic Assessment Panel to review energy efficiency opportunities in the refrigeration and air-conditioning and heat-pump sectors related to a transition to climate-friendly alternatives. In addition, parties had been invited to submit, on a voluntary basis, any relevant information on energy efficiency innovations in those sectors. The submissions received were contained in document UNEP/OzL.Pro.WG.1/39/INF/5. The Panel would prepare a report on the matter for consideration by the parties at their Twenty-Ninth Meeting in November in Montreal.

136. One representative, supported by others, requested an extension to the deadline for the submission of relevant information on energy efficiency, given the small number of parties that had submitted so far, and the challenges faced by many countries in preparing timely submissions on such a new and complex topic. The opportunity for further submissions would make available additional information and promote knowledge exchange on the matter, and give impetus and guidance to those countries that were still at an early stage in developing energy efficiency measures. Lastly, she stressed the importance of mobilizing funding to assist developing countries in that area.

137. A number of representatives urged that a workshop be organized to increase knowledge of energy efficiency opportunities in the refrigeration and air-conditioning sectors during the transition to low-GWP and zero-GWP alternatives, with co-benefits for the climate and for energy provision. Several representatives suggested widening the idea by holding a series of regional workshops to extend the knowledge-building and enabling activities to as many Article 5 parties as possible. Such an initiative would also benefit national ozone officers, who would need to develop expertise outside their traditional responsibilities under the Montreal Protocol. One representative highlighted the need for capacity-building and training of service and maintenance personnel in a field of rapidly changing technology. Another representative said that intermediate opportunities for sharing information were available, such as presentations at regional ozone network meetings. Another representative said that in order to ensure the proper level of expertise, regional seminars or forums, attended by experts and specialists, would be preferable to conventional workshops. It was important, he said, to build strong relationships with experts in order to inform strategy development and policy formulation at the national level.

138. One representative, speaking on behalf of a group of parties, said that energy efficiency was one of the most crucial challenges currently facing the planet. Given the wide scope of the matter, he continued, the Montreal Protocol should focus only on those areas that fell within its areas of expertise. The policies in place in the European Union demonstrated that there were many innovative ways of promoting energy efficiency. Regarding the requests for workshops on energy efficiency, and for more time to submit documentation as requested by decision XXVIII/3, he said that a step-wise approach should be adopted, with the Technology and Economic Assessment Panel first submitting its report to the Meeting of the Parties, in line with its mandate, before considering what further steps to take. Another representative supported that approach. One representative said that discussing energy efficiency under the aegis of the Montreal Protocol, and linking it to the Kigali Amendment, was too ambitious an expectation for the parties to the Protocol and was straying far from the Protocol's mandate.

139. Several representatives urged that a more active, flexible approach be adopted, reflecting the "spirit" of the Kigali Amendment. Energy efficiency was accorded high priority by developing countries, and a holistic, integrated approach needed to be adopted to the implementation of the Kigali

Amendment, whereby the status of energy efficiency was recognized through the timely organization of workshops, as had been done for the matter of safety standards.

140. The representative of India introduced a conference room paper, submitted by India, Bahrain, Kuwait, Lebanon and Saudi Arabia, setting out a draft decision for consideration by the Working Group on issues related to financial and technical support for energy efficiency in Article 5 parties. The draft decision, he said, recognized the importance of energy efficiency for those parties and requested the Technology and Economic Assessment Panel to assess technology and funding requirements of the Article 5 parties to maintain and/or enhance energy efficiency in the refrigeration and air-conditioning and heat pump sectors while phasing down HFCs under the Kigali Amendment to the Montreal Protocol and to assess the elements of incremental capital and operating costs for maintaining and/or enhancing energy efficiency on transitioning to low-GWP alternatives from high-GWP HFCs, drawing on international experience, and requested the Technology and Economic Assessment Panel to submit the report thereon to the Open-ended Working Group at its fortieth meeting, and requested the Ozone Secretariat to organize a workshop on energy efficiency opportunities back to back with that meeting.

141. He observed that the replacement of HFC refrigerants in itself would have limited benefits for climate change, since most of the impacts on emissions arose from energy use. While previous energy efficiency improvements from the phase-out of ozone-depleting substances had been essentially treated as a technology upgrade, in the case of the Kigali Amendment the same principle could not be adopted as the subject matter was global warming. This was of particular importance to developing countries, where the use of refrigeration and air-conditioning would continue to grow, especially in high-ambient-temperature countries. The transition to low-GWP alternatives would have clear implications for energy efficiency, and there was a need to identify those aspects which could be considered in the context of the Montreal Protocol. It was emphasized that energy efficiency needed to be addressed with specific reference to the phasing down of HFCs only. In conclusion, he commended to the Working Group a document submitted to the Executive Committee at its seventy-eighth meeting, held in Montreal in April 2017, on options for improving energy efficiency in air-conditioning in buildings.

142. The representative of Rwanda introduced a conference room paper submitted by the group of African States containing a proposal for a draft decision requesting the Secretariat to organize a workshop to commemorate the thirtieth anniversary of the Montreal Protocol, including discussions on the co-benefits of climate change mitigation and ozone layer protection, and the co-benefits of the Montreal Protocol for the energy sector, including for energy security, cost savings, resilience and efficiency. She expressed the hope that the opportunities to enhance energy efficiency that had been realized in phasing out ozone-depleting substances would be replicated when phasing down HFCs. She also drew attention to the decision of the sixteenth session of the African Ministerial Conference on the Environment, held in Libreville in June 2017, to adopt policies and mechanisms to deliver safe, affordable, effective and efficient cooling technologies in order to implement the Kigali Amendment. She added that she fully supported the proposals put forward by India and others and looked forward to working together with them. She was flexible on the timing of the proposed workshop, and suggested that it could set the stage for further workshops in the future.

143. Several representatives expressed support for the proposals contained in the two conference room papers. All the representatives who took the floor recognized the crucial importance of realizing opportunities to improve standards of energy efficiency in the process of implementing the provisions of the Kigali Amendment, and the need for more information on possible ways forward. Several drew attention to Sustainable Development Goal 7, on access to energy, including the target of doubling the global rate of improvement in energy efficiency by 2030. The implementation of both the Kigali Amendment and the Paris Agreement on climate change would put countries on the path to sustainable development.

144. Several representatives highlighted the negative impacts of high levels of energy consumption on both national economies and greenhouse gas emissions; in some cases, refrigeration and air-conditioning accounted for as much as 50 per cent of electricity consumption in buildings. In other countries refrigeration and air-conditioning accounted for 75 per cent of total energy consumption.

145. Some representatives called for work to be carried out on the implications of work on energy efficiency for National Ozone Units, and the support they could be given through the Multilateral Fund, or other sources of financial assistance, and the general need for capacity-building assistance for Article 5 parties. Several representatives highlighted the cost implications of the installation of new equipment even if the equipment had lower energy running costs thereafter, and the need for investment in training of servicing technicians and in increasing public awareness. Some

representatives observed that information needed to be made available not only on possible ways forward but on what other institutions were doing.

146. Some representatives recalled that the topic had been discussed on many occasions in the debates on the Kigali Amendment. The decision accompanying the adoption of the Amendment incorporated a number of references to energy efficiency, including support for low-volume-consuming countries and a request to the Executive Committee of the Multilateral Fund to include energy efficiency improvements in its guidelines.

147. Several representatives argued that the proposed workshop, which was included in both draft decisions, should be held as soon as possible, preferably back to back with the Twenty-Ninth Meeting of the Parties in November 2017 rather than waiting for the fortieth meeting of the Open-ended Working Group in 2018. This would help advance understanding of the issues; additional workshops could be organized to follow up the initial one. One representative highlighted the value of a workshop, as opposed to a report, in allowing for questions and dialogue; she viewed them as complementary and mutually supportive.

148. Other representatives, however, observed that the Open-Ended Working Group could only forward draft decisions to the Meeting of the Parties for approval; it did not possess the power to take decisions itself, and it would therefore be impossible to agree to organize the workshop in November. There were also budgetary constraints. In any case, it would be preferable to decide the way forward in the light of the report the Technology and Economic Assessment Panel was scheduled to produce for discussion at the Twenty-Ninth Meeting of the Parties.

149. In terms of participation in the workshop, some representatives suggested that policymakers, as well as technical experts, should be invited, as the development of appropriate regulations and building codes was an important part of the discussion. Others suggested that researchers and representatives of industry, including the power sector, and of relevant multilateral institutions, should be included. Others requested the inclusion of a discussion on potential sources of funding. One representative stated that she hoped the process of determining the agenda for the workshop would be open and transparent, and would draw on expertise beyond that present in the Technology and Economic Assessment Panel. Some representatives drew attention to the need for the workshop to be conducted in all United Nations languages.

150. One representative queried the suggestion that the Technology and Economic Assessment Panel should be requested to assess the technology and funding requirements for energy efficiency improvements in Article 5 parties, and argued that funding needs could only be assessed once parties had decided the appropriate way forward. Another representative, however, observed that the Panel had been asked to assess mitigation scenarios for HFC phase-down before the Kigali Amendment had been adopted, so this was not unprecedented. It had been clearly agreed that energy efficiency improvements were a crucial element in implementing the Kigali Amendment.

151. Responding to the discussions, the representative of India stressed the need for action to follow the gathering of information. Accepting that improvements in energy efficiency had always been a feature of previous transitions, he observed that this process nevertheless involved accelerating the normal technology development cycle and always implied up-front costs. It was of course right for the Executive Committee to consider the issue, but it should do so in the context of policy objectives agreed by the parties.

152. The Co-Chair suggested that an appropriate way forward would be for the proposers of the two draft decisions to discuss together how their proposals could be merged, and then to discuss the draft decision with other interested parties. The meeting could then resume discussion of the topic.

153. Subsequently, the representative of India reported that the proposers of the two draft decisions had agreed to merge their proposals into one draft decision, as contained in a revised conference room paper. The revised draft decision requested the Technology and Economic Assessment Panel to assess capacity-building and servicing sector requirements in the refrigeration and air-conditioning and heat pump sectors, and also requested the Ozone Secretariat to organize a workshop on energy efficiency opportunities with specific reference to the phasing down of HFCs at the time of the Twenty-Ninth Meeting of the Parties and the commemoration of the thirtieth anniversary of the Montreal Protocol.

154. Several representatives urged the parties and the Secretariat to show flexibility in organizing the proposed workshop in conjunction with the Twenty-Ninth Meeting of the Parties in Montreal in November 2017, and also requested any interested donors to assist with the funding of the proposed workshop. Several other representatives said that the Secretariat could only organize such a workshop if mandated through a decision of the Meeting of the Parties; the Open-ended Working Group had no mandate to request the Secretariat to undertake such action. Consequently, a workshop in Montreal at

the time of the Twenty-Ninth Meeting of the Parties would need to be organized and funded outside the mandated activities of the Secretariat. The Executive Secretary of the Ozone Secretariat confirmed that the organization of the proposed workshop under the aegis of the Montreal Protocol could only be undertaken as mandated by the Meeting of the Parties.

155. The Working Group agreed to forward the revised draft decision, as set out in section E of annex I to the present report, to the Twenty-Ninth Meeting of the Parties for further consideration.

VIII. Consideration of hydrofluorocarbons not listed in Annex F to the Montreal Protocol (UNEP/OzL.Pro.28/12, para. 197)

156. Introducing item 8 of the agenda, the Co-Chair of the Open-ended Working Group recalled that during the Twenty-Eighth Meeting of the Parties, Switzerland and Norway had submitted a conference room paper setting out draft decision text on a procedure for considering HFCs that were not included in Annex F, but had withdrawn it owing to time constraints and requested that it be added to the agenda of the present meeting. The text of the proposed draft decision had been included in an annex to document UNEP/OzL.Pro.WG.1/39/2.

157. Reintroducing the proposed draft decision, the representative of Switzerland said that the aim was to urge parties to adopt a precautionary approach to the development and promotion of HFCs of significant GWP not listed as controlled substances in Annex F to the Montreal Protocol, given the existence of other HFCs with minimal or no known production or consumption that were not currently controlled under Article 2J of the Protocol. He said that the aim was not to add additional substances to Annex F to the Protocol.

158. Several representatives expressed reservations at the proposal being put forward so soon after the amendment of the Montreal Protocol to include Annex F and the substances listed therein, and urged caution in adopting a different approach to the control of similar substances. One representative said that all HFCs not regulated in Annex F were permitted under the Protocol, and questioned the logic of applying some measures to the control of other HFCs if there was no intention of adding them to the list in Annex F. The representative of Norway responded that the aim was to create a voluntary mechanism to monitor the development of those HFCs that were not listed but had similar global warming potential to those that were listed.

159. One representative said that as it stood, the text of the proposed draft decision presented a number of problems. It was very difficult to define the meaning of "high global warming potential", which was a relative concept for different substances in different sectors. In addition, urging parties to discourage the development of HFCs with high GWP was not consistent with the phase-down policy approach adopted under the Kigali Amendment, was too blunt a policy instrument to deal with a relatively unknown area, and could discourage innovation. A simpler approach would be to maintain the inclusion of such types of substances within the mandate of the Scientific Assessment Panel and the Technology and Economic Assessment Panel so that the parties were periodically informed and could consider control measures if and when concerns arose. Several representatives expressed interest in further discussing the proposal of Switzerland and Norway in order to develop a simpler, more pragmatic approach to dealing with the matter of potential future threats arising from the development of new HFCs.

160. The Working Group agreed to continue discussions on the matter in an informal group.

161. Subsequently, the representative of Switzerland, reporting on the outcomes of the discussions by the informal group, said that the main issues identified had been clarity in affirming that the process did not involve inclusion of new substances under the control measures of the Montreal Protocol, and how to keep the parties informed of new HFCs in a manner that did not place reporting burdens on the parties, for example by requesting the Scientific Assessment Panel to monitor those substances and report regularly to the parties on the matter.

162. The working group agreed that the proponents of the draft decision and interested parties would consider the matter further intersessionally and that a revised draft decision would be presented to the Twenty-Ninth Meeting of the Parties for its consideration in November 2017.

IX. Other matters

163. No other matters were discussed.

X. Adoption of the report of the meeting

164. The parties adopted the present report on Friday, 14 July 2016, on the basis of the draft report set out in documents UNEP/OzL.Pro.WG.1/39/L.1 and Add.1. The Ozone Secretariat was entrusted with the finalization of the report.

XI. Closure of the meeting

165. Following the customary exchange of courtesies, the thirty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol was declared closed at 6.25 p.m. on Friday, 14 July 2017.

Annex I

Draft decisions

The Working Group agreed to forward to the Twenty-Ninth Meeting of the Parties, the following draft decisions for further consideration, on the understanding that they did not constitute agreed text and were subject in their entirety to further negotiation.

The Twenty-Ninth Meeting of the Parties decides:

A. ~~[Approved]~~ Destruction technologies ~~with regard to controlled substances~~

Submission by Australia, Canada, European Union and United States of America

Considering the chemical similarity of hydrofluorocarbons and hydrochlorofluorocarbons, and chlorofluorocarbons and halons, and taking note of the practice to often destroy them together,

Noting the need to approve destruction technologies for hydrofluorocarbons and to keep the list of approved destruction technologies annexed to decision XXIII/12 up to date,

1. To approve on a provisional basis the destruction technologies approved for substances in Group I of Annex A, Annex B and Group I of Annex C, as specified in the annex to decision XXIII/12, for the destruction of substances ~~that will be~~ listed ~~as~~in Annex F;

2. To request the Technology and Economic Assessment Panel to report to the Open-ended Working Group at its fortieth meeting on:

(a) An assessment of the provisionally approved destruction technologies as per paragraph 1 with a view to confirming their applicability to hydrofluorocarbons;

(b) A review of any other technology for possible inclusion in the list of approved destruction technologies in relation to controlled substances;

3. To invite parties to submit to the Ozone Secretariat by [1 February 2018] information relevant to the tasks set out in paragraph 2 above.

B. Essential-use exemption for laboratory and analytical uses for 2018 in China

Submission by China

Noting with appreciation the work done by the Technology and Economic Assessment Panel and its Medical and Chemicals Technical Options Committee**,**

Recalling decision XI/15, by which the parties, among other things, eliminated the use of ozone-depleting substances for the testing of oil, grease and total petroleum hydrocarbons in water from the global exemption for laboratory and analytical uses,

Recalling also decision XXIII/6, by which parties operating under paragraph 1 of Article 5 of the Montreal Protocol were allowed until 31 December 2014 to deviate from the existing ban on the use of carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water in individual cases where such parties considered doing so to be justified, and in which it was clarified that any deviation beyond that should take place only in accordance with an essential-use exemption in respect of the use of carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water beyond 2014**,**

Noting that China has reported difficulty in implementing existing alternatives to the use of carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water and has indicated that it needs more time for the revision and promotion of national standards, and noting also that the party is taking necessary measures to implement the alternatives and has expressed a willingness to continue doing so,

1. To encourage China, which has applied for an essential-use exemption for the use of carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water, to complete the revision of a relevant national standard (HJ637), [scheduled in 2018,] which will be brought into force as soon as possible with a view to ensuring a smooth transition to a method that does not use ozone-depleting substances;

2. To request that China, prior to submitting any further requests for essential-use exemptions for the use of ozone-depleting substances for the testing of oil, grease and total petroleum hydrocarbons in water, continue to provide information on its further evaluation of the use of other

international analytical methods for such testing and the national circumstances that make using them difficult and on the evaluation of available alternative sources of higher purity tetrachloroethylene, on progress in the development of its method, including the progress with the purification of tetrachloroethylene as the carbon tetrachloride alternative and the associated required reagent stability, and in the revision of the relevant national standards, as well as to provide a timeline for the phase-out of carbon tetrachloride for laboratory and analytical uses, indicating the anticipated steps and dates in that process;

3. To authorize the level of consumption for China for 2018 necessary to satisfy essential uses of carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water, as specified in the annex to the present decision;

Annex to decision XXIX/[..]

Essential-use authorization for 2018 for carbon tetrachloride for the testing of oil, grease and total petroleum hydrocarbons in water (metric tonnes)

Party	*2018*
China	65

C. Issues related to the phase-out of hydrochlorofluorocarbons

Submission by Australia, Canada, Japan and the United States of America

Aware that parties not operating under paragraph 1 of Article 5 of the Montreal Protocol (non-Article 5 parties) are taking measures to reduce and eventually eliminate the production and consumption of the ozone-depleting substances listed in Annex C, group I (hydrochlorofluorocarbons),

Recognizing a need for continued consideration of issues related to hydrochlorofluorocarbons as indicated in paragraphs 12, 13, and 14 of decision XIX/6, and taking into account the report of the Technology and Economic Assessment Panel in response to decisions XXVII/5 and XXVIII/8,

Noting that the Halons Technical Options Committee considers there is some likelihood that there will be aircraft rescue and firefighting applications that would continue to need clean agents in the 2020–2030 timeframe,

Noting that the Medical and Chemicals Technical Options Committee has identified hydrochlorofluorocarbons used as solvents which may have continued need in certain precision cleaning applications and manufacturing processes (that could be process-agent applications),

1. To request the Technology and Economic Assessment Panel, in relation to Annex C, group I, substances, to assess non-Article 5 requirements between 2020 and 2030 and beyond for:

(a) Volumes and areas of possible needs in fire suppression sectors including those that require use of clean agents;

(b) Volumes and areas of possible needs for solvents applications, such as servicing and potential process-agent uses; and

(c) Volumes and areas of possible other niche uses.

2. To invite parties and other interested entities to provide further relevant information to the Ozone Secretariat by 31 December 2017, for inclusion in the Panel's progress report;

3. To request the Panel to report on the assessment referred to above by 1 March 2018.

D. Use of controlled substances as process agents

Submission by the European Union

Noting with appreciation the 2017 progress report of the Technology and Economic Assessment Panel and especially insofar as it pertains to process agents;

Recalling that table A of decision X/14, on process agents, has been updated by decisions XV/6, XVII/7, XIX/15, XXI/3, XXII/8 and XXIII/7;

Noting that the Panel's 2017 progress report takes account of the information provided by parties in accordance with decision XXI/3;

Noting also that the 2017 progress report of the Technology and Economic Assessment Panel recommends the removal of three processes from table A of decision X/14 as last updated by decision XXIII/7;

1. To update table A of decision X/14 as set out in the annex to the present decision;

2. To urge parties to update their information on the use of controlled substances as process agents and provide the Ozone Secretariat by 31 December 2017 with information on the implementation and development of emissions reduction techniques;

3. To request the Technology and Economic Assessment Panel to report to the forty-first meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer on the industrial application of any alternative technologies employed by parties that have already eliminated the use of controlled substances as process agents in the processes listed in table A, as updated in the annex to the present decision

Table A
List of uses of controlled substances as process agents

No.	*Process agent application*	*Substance*	*Permitted parties*
1	Elimination of NCl_3 in chlor-alkali production	CTC	European Union, Israel, United States of America
2	Recovery of chlorine by tail gas absorption from chlor-alkali production	CTC	European Union, United States of America
3	Production of chlorinated rubber	CTC	European Union
4	Production of chlorosulfonated polyolefin (CSM)	CTC	China
5	Production of aramid polymer (PPTA)	CTC	European Union
6	Production of synthetic fibre sheet	CFC-11	United States of America
7	Photochemical synthesis of perfluoropolyetherpolyperoxide precursors of Z-perfluoropolyethers and difunctional derivatives	CFC-12	European Union
8	Preparation of perfluoropolyether diols with high functionality	CFC-113	European Union
9	Production of cyclodime	CTC	European Union
10	Bromination of a styrenic polymer	BCM	United States of America
11	Production of high modulus polyethylene fibre	CFC-113	United States of America

E. Issues related to financial and technical support for energy efficiency in countries operating under paragraph 1 of Article 5

Submission by India, Bahrain, Kuwait, Lebanon, Saudi Arabia and the African Group

Recalling decision XXVIII/2, which inter alia mentions development of cost guidance associated with maintaining and/or enhancing the energy efficiency of low global warming potential (GWP) or zero-GWP replacement technologies and equipment, when phasing down hydrofluorocarbons, while taking note of the role of other institutions addressing energy efficiency, when appropriate,

Recognizing the need to maintain and/or enhance energy efficiency while transitioning away from high-GWP hydrofluorocarbons to low-GWP alternatives in the refrigeration, air-conditioning and heat pump sectors,

Noting that the use of air-conditioning and refrigeration is growing in countries operating under paragraph 1 of Article 5,

Recognizing that the impact of maintaining and/or enhancing energy efficiency would have a significantly higher impact on climate than only the reduction due to phase-down of high-GWP hydrofluorocarbons under the Montreal Protocol,

1. To request the Technology and Economic Assessment Panel to assess the technology and funding requirements of the parties operating under paragraph 1 of Article 5 to maintain and/or enhance energy efficiency in the refrigeration and air-conditioning and heat-pump sectors while phasing down hydrofluorocarbons under the Kigali Amendment to the Montreal Protocol, as well as to develop scenarios and to also assess capacity-building and servicing sector requirements in the refrigeration and air-conditioning and heat-pump sectors;

2. To assess the elements of incremental capital and operating costs for maintaining and/or enhancing energy efficiency on transitioning to low-GWP alternatives from high-GWP hydrofluorocarbons, drawing on international experience;

3. To request the Technology and Economic Assessment Panel to submit the report by the fortieth meeting of the Open-ended Working Group, to be held in 2018, and to provide annual updates subsequently;

4. To request the Ozone Secretariat to organize a workshop on energy efficiency opportunities with specific reference to the phasing down of hydrofluorocarbons at the commemoration of the thirtieth anniversary of the Montreal Protocol.

Annex II

Summaries of presentations by the members of the Technology and Economic Assessment Panel

A. Report of the Scientific Assessment Panel on global warming potentials in Group I of Annexes A, C and F

1. Mr. John Pyle, Mr. Paul Newman and Mr. Bonfils Safari, Co-Chairs of the Scientific Assessment Panel, gave a presentation on the report of the Panel on global-warming potentials (GWPs) in Group I of Annexes A, C and F in line with the agreement reached in the contact group on the feasibility and ways of managing HFCs at the Twenty-Eighth Meeting of the Parties to the Montreal Protocol held in Kigali in October 2016, that in order to give effect to new subparagraph 9 (a) (ii) of Article 2 to the Montreal Protocol, the Scientific Assessment Panel would need to begin the work necessary to provide the Meeting of the Parties with the information it would require to adjust the global-warming potentials of the substances in Group I of Annex A, Annex C and Annex F in accordance with that subparagraph and that it should report on its progress in that regard to the Open-ended Working Group at its thirty-ninth meeting (UNEP/OzL.Pro.28/12, para. 204).

2. They explained that: hydrofluorocarbon (HFC) and hydrochlorofluorocarbon (HCFC) GWPs were necessary for calculating the Kigali Amendment baselines for the HFC phase-down.

3. They said that a GWP was a metric for evaluating the climate forcing of a substance relative to CO_2 over a specified period (typically 20, 100 and 500 years). The GWP was specifically the global radiative forcing of 1kg of a particular gas with respect to 1 kg of CO_2 over a time period (in this case 100 years). By definition, the GWP of CO_2 was 1.0, while CFC-11 was 4,660 (WM0, 2014). The GWP metric was developed for the first assessment of the Intergovernmental Panel on Climate Change (Derwent, Rodhe, and Wuebbles, 1990), and was very similar to the ozone depletion potential (ODP), but was used for comparing climate impacts. The GWP depended on: (a) the time horizon (20, 100 or 500 years); (b) the substance's atmospheric lifetime; (c) the infrared spectrum; and (d) the absolute global warming of a CO_2 change. Scientific improvements led to changes in factors (b) through (d) and, over time, those had led to GWP changes. As a typical example, the HCFC-22 100-year GWP had been revised a number of times since 2002, varying from a low value of 1760 (IPCC, 2013) to a high value of 1810 (WMO, 2007), with a current best estimate of 1780 (WMO, 2014).

4. A particular problem was that only 8 GWPs were included for 40 substances listed under Annex C. Among these missing GWPs were those for HCFC-121, HCFC-122, and 133. Annex C GWPs are derived from the fourth assessment report of the Intergovernmental Panel on Climate Change, but these values (table 2.14 IPCC, 2007) were adapted from the *Scientific Assessment of Ozone Depletion: 2006* (WMO, 2007) table 8-2. In the calculation of baseline consumption and production, a missing GWP was assumed to be zero. WMO (2014) included an updated list of 13 HCFC GWPs.

5. The Scientific Assessment Panel noted that HCFC GWPs for all the missing values in Annex C had now been calculated by Mr. K. Dimitrios, Mr. P. Papanastasiou, Mr. Marshall and Mr. J. B. Burkholder of the National Oceanic and Atmospheric Administration. They had drafted a paper entitled "Hydrochlorofluorocarbons (HCFCs) Ozone Depletion and Global Warming Potential Determination," which would be submitted shortly to a peer-reviewed journal. The paper was a comprehensive evaluation of C1, C2, and C3 HCFCs, for 274 compounds, including all isomers and stable conformers. The paper would include lifetimes, ODPs, GWPs, and global temperature change potential (GTPs) for all of these compounds. The total uncertainty of GWPs was relatively small for well-measured compounds such as CFC-11 but could be ~40 per cent for the new GWP estimates due to: (a) modelled infrared (IR) spectra, (b) lifetimes, and (c) the CO_2 absolute global-warming.

6. The report of the Scientific Assessment Panel concluded by noting that the authors of "The Scientific Assessment of Ozone Depletion: 2018" had been selected, and the first draft of the report was being written (with the final report to be available in December 2018). The assessment would include a chapter on scenarios and information for policymakers, which would include GWP revisions and new estimates.

B. Report of the Technology and Economic Assessment Panel on the 2018–2020 replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol (decision XXVIII/5)

7. Ms. Shiqiu Zhang, co-chair of the replenishment task force, began the presentation by elaborating on the mandate in decision XXVIII/5, which requested the Technology and Economic Assessment Panel to prepare a report on the appropriate level of the replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the triennium 2018–2020. She reviewed key parts of the decision which provided the terms of reference for the Panel including but not limited to the following: that the Panel would take into account all control measures and relevant decisions agreed upon by the parties to the Montreal Protocol and the Executive Committee of the Multilateral Fund up to and including its seventy-eighth meeting; that the Panel should provide indicative figures of the resources within the estimated funding required for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives and indicative figures for any additional resources that would be needed to further encourage the use of low-GWP or zero-GWP alternatives; that the Panel should provide indicative figures for the periods 2021–2023 and 2024–2026 to support a stable and sufficient level of funding. In terms of the approach taken by the Panel on its report, Ms. Zhang mentioned that the Panel had established a replenishment task force that had consulted widely, relied on existing cost guidelines under the Multilateral Fund, noted limitations on any funding estimates provided (i.e., where cost guidelines for HFC phase-down activities remained under discussion in the Executive Committee), and used as important guidance the adjusted business plan of the Multilateral Fund for 2017–2019 after the seventy-seventh meeting of the Executive Committee (also referred to as the "business plan").

8. Mr. Lambert Kuijpers, co-chair of the task force, outlined the remainder of the presentation which he indicated followed the sequence of the chapters in the report of the various components of the total funding requirement for the Multilateral Fund for the 2018–2020 triennium. He then presented chapter 3 of the report on the funding component for HCFC Phase-out Management Plans (HPMPs). He noted that substantial HPMP funding had already been approved for 2017–2026 (through the Executive Committee at its seventy-seventh meeting), that additional funding was derived from the business plan for (planned) HPMP activities for the period 2018–2020, that the currently approved funding did not cover 2020 compliance for all countries, and that funding was estimated for countries that would not achieve the 35 per cent reduction in 2020 with currently approved funding. He indicated that where planned reduction percentages for some countries were agreed after 2020, this funding after 2020 had been excluded from the triennium 2018–2020. Mr. Kuijpers reviewed a graph showing HPMP approved funding in the period 2017–2026. He also reviewed components of HPMP funding based on approved and planned funding for HPMP activities in non-low-volume-consuming and low-volume-consuming (LVC) parties. He then summarized the total estimated funding for HPMPs in the 2018–2020 period as follows: a funding range of $391.9–$420.9 million for HPMPs; additional funding for a China (planned) stage III HPMP in the range of $0–$70 million; and additional funding of $140,000 for two LVC countries with an HPMP stage III in the business plan. He then mentioned a total funding requirement of $391.91–$491.85 million for the period 2018–2020.

9. Mr. Kuijpers then discussed chapter 4 related to the HCFC Production Phase-out Management Plans (HPPMPs). Only two countries were considered for production phase-out funding via an HPPMP, where the stage II production sector HPPMPs total funding for the period 2018–2020 was assumed at $67.22 million. He noted that no swing plant phase-out funding had been considered, noting that swing plants might be considered (in the future) in relation to HFC-23 mitigation.

10. For chapter 5 on funding for non-investment and supporting activities, Mr. Kuijpers noted that institutional strengthening funding was calculated on the basis of amounts already indicated in the business plan for 2018, 2019 and 2020; that HPMP preparation costs were assumed to be similar to previous HPMP preparation costs, estimated at $8.7 million for the triennium 2018–2020; and that, for demonstration projects, two options of assumptions were made: (a) by 2017–2018, no further demonstration projects on the feasibility of specific low-GWP options would be agreed or (b) in the next triennium, a similar amount of funding compared to past trienniums may be needed for demonstration projects - so that a range of $0–10 million was estimated. Supporting activities (calculated using current Executive Committee decisions) included UNEP Compliance Assistance Programme (CAP) funding, core unit funding for agencies, costs for the secretariat of the Multilateral Fund and the holding of Executive Committee meetings, and costs for the Treasurer. The estimated total funding requirement for the 2018–2020 period for non-investment and supporting activities was estimated in the range of $114.08–$124.08 million.

11. Ms. Bella Maranion, co-chair of the task force, discussed chapter 6 on HFC enabling activities. She noted that the most important element for preparing for the funding of the HFC phase-down was the "enabling activities" (for the period covered in this triennium 2018–2020); she also noted that the term "enabling activities" had not previously been used for the HCFC phase-down. The categories for enabling activities had been defined in paragraph 20 of decision XXVIII/2 as capacity-building and training, institutional-strengthening, Article 4B licensing, reporting, demonstration projects and the development of national strategies. While the Executive Committee had held initial discussions on guidelines for funding the HFC enabling activities at its April 2017 meeting, it had agreed to continue discussions at its seventy-ninth meeting in Bangkok in July 2017. Therefore, at the time of the completion of the replenishment report, no guidelines related to HFC enabling activities had yet been developed. She explained the methodology used in the report to provide the range of funding for enabling activities which were essentially two approaches: (a) for the low end of the range, an approach that looked at experience under HCFC stage I HPMPs for project preparation and demonstration projects; (b) for the high end of the range, an approach that was proposed at the seventy-eighth meeting of the Executive Committee based on a certain amount per Article 5 party depending on HCFC baseline and historical funding. This provided a range of $13.5–$20.2 million for non-investment projects in the 2018–2020 period. Because the decision requested the Panel to provide indicative figures for additional resources that would be needed to further encourage parties to use low-GWP or zero-GWP alternatives and gradually phase down HFCs, the Panel had derived a range of funding, based on the study in the June 2014 replenishment report (i.e., second conversion projects as well as stationary air-conditioning projects), of $8–$24 million. The estimated total funding requirement for the 2018–2020 period for enabling activities was therefore estimated at $21.5–$44.2 million.

12. Ms. Maranion then discussed chapter 7 on HFC-23 mitigation activities. Decision XXVIII/1, with regard to Annex F, Group II substances (i.e., HFC-23), required that each party ensure that, starting on 1 January 2020 and each year thereafter, each production facility that generated emissions of HFC-23 destroyed HFC-23 to the extent practicable using technology approved by the parties. This implied that 2020 would be the first year for HFC-23 destruction under the Montreal Protocol, where 2020 fell within the period considered in the present triennium. Ms. Maranion provided some background information related to HFC-23: noting that it was a by-product in HCFC-22 production; that HFC-23 has been incinerated in a number of HCFC-22 production plants with funding via the Clean Development Mechanism (CDM); that many of the incineration plants established via the CDM mechanism were still in operation or could be operated again (after maintenance and repair); that drivers for HFC-23 destruction such as subsidies or regulatory mechanisms now existed in China and India; and that the document of the seventy-eighth meeting of the Executive Committee on key aspects related to HFC-23 by-product control technologies (UNEP/OzL.Pro/ExCom/78/9) used as a reference in the report provided a good overview of the state of the HCFC-22 production lines with and without destruction facilities in six Article 5 parties – 4 of 42 HCFC-22 production lines had no destruction facility. She then explained that the cost ranges for HFC-23 mitigation activities were developed through the investigation of the investment costs for new incineration plants as well as for the operational costs of these plants. Up to $0.5 million per year for a (large) new incineration facility had been estimated; for operational costs, a range of $0.5–$1.5 per kg HFC-23 mitigation per year had been used. Assuming that all facilities in all developing countries would be funded for their operational costs in 2020, a total funding range had been calculated: it included a relatively small amount for bringing plants back to operation ($0.8 million) plus capital and operating costs estimated at $7.2–$20.7 million. The total estimated range of funding for HFC-23 mitigation activities in the period 2018–2020 was therefore $8–$21.5 million.

13. Ms. Maranion summarized the total funding requirement for the triennium 2018–2020 as in the range of $602.71–$748.85 million. For the indicative amounts of funding required for the next two trienniums, she noted a number of considerations were important in these future periods: that substantial funding after 2020 for HCFCs would be needed (HPMP stage II tranches); that funding would be required for HCFCs that remained to be phased out including stage III HPMPs; that non-investment and supporting activities could be estimated in ranges similar to the 2018–2020 funding; that HFC-23 mitigation activities would continue and require funding beyond 2020. She noted that funding for HFC phase-down plans was difficult to estimate given the lack of Executive Committee guidelines at the time of the completion of the report; therefore "to be determined (TBD)" had been used although the report noted that funding for HFC conversion in the future would be substantial, if compared to HCFCs in the stage I HPMP period. Ms. Maranion concluded the presentation by providing the total indicative range of funding required in future trienniums 2021–2023 and 2024–2026 as $634.8–$771 million and $548.5–$695.5 million, respectively.

C. Progress reports on the Technology and Economic Assessment Panel 2017 report (volumes I and II), including related issues, by the Panel and the technical options committees

1. Technology and Economic Assessment Panel 2017 report

14. The Technology and Economic Assessment presentation of its 2017 report was introduced by Mr. Ashley Woodcock, Panel Co-Chair, who outlined the overall plan of the progress report presentation on behalf of the Technology and Economic Assessment Panel. He said that it had been a very busy year for the Panel, with several important reports and presentations for submission to the Open-ended Working Group. He introduced Mr. Paulo Altoe, the new co-chair of the Foams and FTOC, who then presented the FTOC Progress Report.

2. Flexible and Rigid Foams Technical Options Committee progress report

15. Mr. Paulo Altoe, Co-Chair of the Flexible and Rigid Foams Technical Options Committee, commenced his presentation by stating that the foams global market had been growing by 4 per cent annually in recent years. He pointed out that three main groups (specialty, polystyrene and polyurethane foams) were used in construction and the food chain and in both they were critical factors in reducing energy consumption. He pointed out that in most non-Article 5 parties, F-gas regulations now provided precise dates for the phase-out of high-GWP HFCs used in foam manufacture. In Article 5 parties, Mr. Altoe pointed out that the major challenge in phasing out HCFCs at same time as high-GWP HFC blowing agents was that high-GWP HFCs, hydrofluoroolefins (HFOs), hydrochlorofluroolefins (HCFOs) were three times the cost of HCFCs. Currently HFO/HCFO blown foams were the most expensive owing to the cost of low-GWP blowing agents and the additional costs of special additives required to stabilize the fully formulated polyol blends. In conclusion, he said that decisions on transition could be accelerated by capacity-planning by regulators, producers and users, optimizing performance and/or cost for individual applications, and improved availability and lower cost of low-GWP blowing agents.

3. Halons Technical Options Committee progress report

16. The Halons Technical Options Committee Co-Chair, Mr. Adam Chattaway, presented the progress report consisting of an update on alternatives, an update on civil aviation, and further follow-up to decision XXVI/7. With regard to alternatives for halons, Mr. Chattaway noted that the new agent, HCFO-1233zd(E), had received United States of America Significant New Alternatives Policy (SNAP) listing as acceptable in total flooding fire protection applications in 2016, but the manufacturer of this agent had subsequently withdrawn it from listing in two international fire protection standards. Such listing was required prior to its use in this application in countries that adopted such standards. Mr. Chattaway then presented information on civil aviation matters; the International Civil Aviation Organization (ICAO) had now mandated dates by which halons were no longer allowed to be installed on new aircraft. The final application to receive a date was cargo compartment fire protection. In continuing his presentation, Mr. Chattaway then presented information to the effect that the decision XXVI/7 report findings remained unchanged and that there was not enough halon 1301 for civil aviation, and although the current estimate for the run-out date was 2035, there were many unknown factors that could bring that date forward. Therefore there was a need to better quantify the rate of increase of installed amounts and the resulting emissions from civil aviation. Mr. Chattaway concluded by stating the parties may wish to consider requesting that ICAO form a working group, or similar body, in conjunction with the Halons Technical Options Committee to quantify current and future civil aviation installed base and emissions, and for the Committee to report back thereon at the Thirty-First Meeting of the Parties to the Montreal Protocol.

4. Refrigeration, Air-conditioning and Heat Pumps Technical Options Committee progress report

17. Mr. Roberto Peixoto, Co-Chair of the Refrigeration Air-conditioning and Heat Pumps Technical Options Committee then presented the highlights of its progress report. Initially he mentioned that with the adoption of the Kigali Amendment, research and development to improve the performance of refrigeration, air-conditioning and heat pumps equipment with low-GWP alternatives was accelerating. Regarding the use of flammable hydrocarbon refrigerants in refrigeration appliances, he said that, recently, the charge limit of flammable refrigerants in the United States had increased from 57g to 150g, and the use of HC-600a for new domestic appliances continued to grow globally and it was estimate that 75 per cent of the domestic refrigeration production would use this refrigerant in 2020.

18. He said that new transcritical carbon dioxide (R-744) systems for supermarkets, with the latest developments such as multi-ejectors, parallel compressors, among other things, were being developed and installed in order to reduce energy penalties, and these improvements in the technology would expand the use of transcritical carbon dioxide (R-744) systems to warmer countries. Mr. Peixoto noted that the production of air-conditioners using HFC-32 refrigerant as an alternative to R-410A continued in Japan, South-East Asia and Australia and was expanding into Europe. He also said that in India, the production of split air-conditioners using HC-290 (propane) refrigerant continued, while in China production lines had been converted for the use of that refrigerant.

19. He said that HFO-1234yf was being adopted as the main HFC-134a replacement for mobile air-conditioning systems, and it was estimated that around 20 million vehicles had air-conditioning systems with that refrigerant, and that R-744 (CO_2) was under evaluation for heating and cooling systems on pure electrical vehicles. Where it concerned non-vapour compression technologies, called not-in-kind, Mr. Peixoto noted that research in magnetocaloric technology was being carried out, and new material and prototypes were being developed. Regarding the use of heat pumps, Mr. Peixoto said that in Europe, Japan and the United States, the legislation on minimum energy efficiency for water heating heat pumps had come into effect, and in China the Government was strongly promoting heat pumps in order to reduce the air pollution caused by fossil fuel heating. He concluded his presentation by saying that new chillers, with improved energy efficiency, were coming to the market with improved design, using variable speed drives, permanent magnet motors, and sophisticated control systems; and concerning refrigerated transport, an HFC/HFO blend (R-452A) was coming into use in refrigerated trucks and containers, while HC-290, R-744 and HFC-32 were being tested.

5. Medical and Chemicals Technical Options Committee progress report and essential-use nomination assessment

20. Ms. Helen Tope, Co-Chair of the Medical and Chemicals Technical Options Committee, presented highlights from its progress report. She reported that the global transition away from chlorofluorocarbon (CFC) metered-dose inhalers (MDIs) was almost complete, with China and the Russia Federation manufacturing CFC MDIs from remaining CFC stockpiles in 2015 and 2016. She highlighted the 98 per cent reduction in CFC quantities used for this purpose since 1997, marking a major achievement of the Montreal Protocol and the stakeholders involved. Ms. Tope reported that for medical aerosols, around 2,500 tonnes of HCFCs were used in China. She presented the committee's review of information on controlled substances used as process agents submitted by parties in accordance with decision XVII/6 on process agent use exemptions, make-up and emissions. She indicated that the quantities of controlled substances used for make-up and consumption and emitted had decreased since 2011 when tables A and B, for the uses of controlled substances as process agents, were last updated by parties in decision XXIII/7. In addition she indicated that several parties were no longer reporting data for certain process agent uses, indicating that these processes were no longer in use in those parties. Based on the information reported, she highlighted that parties might wish to consider removing from table A, the production of chlorinated polypropene, chlorinated ethylene vinyl acetate, and methyl isocyanate derivatives, and the United States for production of chlorosulfonated polyolefin, and, for table B, reducing the quantities of make-up and consumption and maximum emissions levels contained therein, and, in addition, for parties to provide some updated information on the remaining eleven process agent uses. On other chemicals issues, Ms. Tope reported an upward trend in the quantities of controlled substances produced and imported for feedstock uses over the last decade. She highlighted that to enable better estimation and reporting on the global production of n-propyl bromide, which was not a controlled substance, that parties might wish to consider providing production data. In response to paragraph 8 of decision XVII/10, requesting the Technology and Economic Assessment Panel to report on laboratory and analytical uses that could be performed without methyl bromide, she reported that there was a wide range of alternatives available for methyl bromide when used as a methylating agent, and an insignificant quantity of methyl bromide used in this and other laboratory and analytical applications. On the discrepancy in carbon tetrachloride emissions, Ms. Tope reported that the Technology and Economic Assessment Panel was collaborating with the Scientific Assessment Panel and other experts to share information on carbon tetrachloride emissions estimations through web-based meetings. Ms. Tope then outlined the essential-use nomination submitted by China for 65 tonnes of carbon tetrachloride for 2018 for laboratory and analytical uses for the testing of oil, grease and total petroleum hydrocarbons in water. She reported that China was still in the process of developing an alternative standard for testing oil in water, with delays mainly due to the difficulty in purifying the proposed alternative, tetrachlorethylene. She indicated that China predicted that the publication of a new standard could take place in 2018, delayed by one year than previously indicated. The Technology and Economic Assessment Panel recommended that parties authorize an exemption for 65 tonnes of carbon tetrachloride and requested that China provide information on progress in the development of its alternative method, progress with

its studies of the purification of tetrachloroethylene, evaluation of available alternative sources of higher purity tetrachloroethylene, any further evaluations regarding the use of non-ozone-depleting-substance international or national analytical methods for testing oil in water, and timelines for the phase-out of carbon tetrachloride in that use, indicating anticipated steps and an end date in that process.

6. Decision XXVIII/8: issues related to the phase-out of hydrochlorofluorocarbons

21. Mr. Daniel Verdonik, co-chair, Halons Technical Options Committee, provided the report on decision XXVIII/8 and issues related to the phase-out of HCFCs. Mr. Verdonik explained that decision XXVII/8 requested the Technology and Economic Assessment Panel to update the decision XXVII/5 findings from 2016 and to report thereon to the Open-ended Working Group at its thirty-ninth meeting. The decision also invited parties to provide relevant information to the Ozone Secretariat for inclusion in the Panel's assessment. He noted that the Panel had received responses from Armenia, Bangladesh, the European Union, Jamaica, Japan, Mauritius, Mexico and the United States, and that the Panel had incorporated the information from those responses in the assessment. Mr. Verdonik further explained that the Panel also continued to collect other relevant information, which was being incorporated into the update.

22. As it related to basic domestic needs production, Mr. Verdonik indicated that the findings from decision XXVII/5 from 2016 still held and that the Panel was of the opinion that consumption for HCFCs in 2020 would be less than allowed production. Therefore, HCFCs for basic domestic needs for Article 5 parties were not going to be needed beginning in 2020.

23. In the refrigeration and air-conditioning sector, Mr. Verdonik stated that the decision XXVII/5 report finding remained unchanged that small, as of yet unidentified, uses in niche applications could potentially satisfy the criteria set out in decision IV/25 on "essentiality" in non-Article 5 parties and that no refrigeration and air-conditioning applications for HCFC-22 had been identified that might be considered essential. For servicing needs in refrigeration and air-conditioning, while it was difficult to draw conclusions on specific needs, newly produced HCFC-123 and other HCFCs for refrigeration and air-conditioning blends might be required in the period 2020–2030. After 2030, when the 0.5 per cent servicing tail was no longer available for non-Article 5 parties, it was possible that newly produced HCFCs could be needed to service existing equipment in very specific applications.

24. Mr. Verdonik further said that in the fire protection sector, the findings for potential essential uses and servicing needs from decision XXVII/5 remained unchanged. HCFC-123 for the production of HCFC-based blend B not exceeding 900 tonnes annually in non-Article 5 parties could be needed, which represented about 20 ODP-tonnes. He explained that the Panel had not identified any foam HCFC uses that could be considered as potentially essential. In the solvent sector, he said that the Panel was of the view that it remained possible that some niche solvent applications, such as aerospace or military, might require small amounts to service existing equipment, e.g., HCFC-121, HCFC-122a, HCFC-141b and HCFC-225ca/cb, and that it was likely that essential uses for non-Article 5 parties would be required for both laboratory and analytical uses, and for research into and development of new substances, consistent with the decision XXVII/5 findings. He also noted that the Panel estimated that all solvent applications might require less than several hundred tonnes annually (i.e., a few ODP-tonnes).

25. Mr. Verdonik said that there was one new finding for this assessment. He explained that the Panel had now identified several manufacturing processes that used about 100 tonnes of HCFC-141b and HCFC-225ca/cb in total as solvents in processes that might be considered similar to process agent uses. He noted that the Panel was aware that alternative processes were under development and were expected to be completed by 2020 but that was not certain. He further noted that the Panel was concerned that such uses could be impacted by the 2020 phase-out and therefore the parties might wish to consider clarifying how to treat any HCFC solvent uses in processes that were similar to process agents beginning in 2020.

7. Methyl Bromide Technical Options Committee progress report and critical-use nominations interim report

26. Methyl Bromide Technical Options Committee Co-Chairs, Ms. Marta Pizano, Mr. Ian Porter and Mr. Mohammed Besri, presented an overview of the May 2017 progress report and the critical-use nominations interim report. Starting the presentation, Mr. Besri reported that 99 per cent of reported controlled uses of methyl bromide had been phased out. However, the Methyl Bromide Technical Options Committee had identified a possible discrepancy between the reported consumption and the atmospheric emission concentrations of around 15,000 tonnes. He said that parties might wish to consider investigating this apparent discrepancy. He added that nearly all the methyl bromide used for

quarantine and pre-shipment was emitted to the atmosphere, as recapture systems were available but not often used. This situation was offsetting the benefit gained by the phasing out of controlled uses. He added that parties might wish to consider controlling the use of methyl bromide for those uses of quarantine and pre-shipment for which proven alternatives were available. He further noted that that the official reporting of stocks under the present decisions was only a requirement for those parties that submitted critical-use nominations and thus an unknown, unreported amount of stocks could be held and/or used by parties that did not submit a critical-use nomination. In his concluding remarks he addressed other methyl bromide matters, particularly the difficulties encountered by some parties in interpreting methyl bromide use categories (controlled or exempted).

27. Mr. Porter introduced the 2017 interim recommendations for critical use of methyl bromide by showing the trends in the total critical-use amounts since the phase-out deadline in 2005 for non-Article 5 parties and 2015 for the Article 5 parties. He explained that the two non-Article 5 nominations for strawberry runners from Australia and Canada continued, virtually unchanged. The Methyl Bromide Technical Options Committee was urging those parties to review the regulations to allow for the adoption of alternatives. Since 2015, however, exempted amounts of methyl bromide for three Article 5 parties (Argentina, China and South Africa) generally continued to reduce. He then provided an overview of the final recommendations for critical-use nominations for six nominations for preplant soils. These came from two non-Article 5 parties (Canada for 2018 and Australia for 2019) and three Article 5 parties (Argentina, China and South Africa) all for 2018. For the Australian strawberry runner nomination in 2019, the interim recommendation was for a 20 per cent reduction of the nominated amount of 28.98 tonnes based on an amount equivalent to the committee's standard presumptions. The Methyl Bromide Technical Options Committee was of the view that continued methyl bromide supply to this sector could in itself be becoming a barrier to technological improvement and the adoption of alternatives. The committee was unable to assess the Canadian strawberry runner nomination for 2018 for 5.261 tonnes as the Panel was still seeking clarity on why a key alternative, chloropicrin, which the party considered may contaminate groundwater, was used on Prince Edward Island in methyl bromide/chloropicrin formulations, but could not be used when applied alone or with other alternatives. The party had advised that despite its use as described above, chloropicrin was not being monitored in groundwater and no studies would be conducted on its potential to contaminate groundwater. In view of this situation, the Methyl Bromide Technical Options Committee was seeking direction from the parties on how to assess this nomination.

28. Both nominations from Argentina (strawberry fruit - for 45.3 tonnes and tomatoes – for 75.4 tonnes) had been reduced to meet the standard presumptions for methyl bromide dosage rates used with barrier films over a three-year adoption period. A further 10 per cent reduction had been made for the uptake of available alternatives. For the strawberry fruit nomination the party was urged to consider practices which improved the likelihood of adoption of available alternatives (i.e., 1,3-D/Pic) and for the tomato nomination the Methyl Bromide Technical Options Committee did not accept an increase in the nominated amount with respect to the critical-use nomination approved in 2016. For the nomination from China for open field ginger of 74.617 tonnes the interim recommendation was reduced in accordance with the Methyl Bromide Technical Options Committee standard presumptions for use with barrier films; the nomination for protected ginger of 18.36 tonnes was accepted in full. It was noted that China had indicated an intention that this would be the last year of these nominations.

29. Ms. Pizano then summarized the critical-use nominations related to methyl bromide use in commodities and structures from South Africa. The interim recommendation for the mills was brought down from 5.0 tonnes to 2.9 tonnes on the basis of an adjusted dosage rate and reduced treatment frequency, which the Methyl Bromide Technical Options Committee considered would be effective. The nomination of 45.0 tonnes of methyl bromide for fumigation of houses was recommended at a reduced amount of 42.75 tonnes to account for the adoption of heat, considered to be a suitable alternative for a portion of the nomination. In finalizing the presentation, Ms. Pizano indicated that total reported stocks from all parties were noted at 91.0 tonnes, highlighting that although the reported level of stocks was small, there might be unreported stocks. In finalizing the presentation she explained that critical-use exemption recommendations had not been adjusted for stocks.

8. Technology and Economic Assessment Panel administrative issues

30. In finishing the Technology and Economic Assessment Panel progress report presentation, Ms. Pizano referred to administrative issues related to the work of the Panel. In the first instance, she thanked the more than 150 experts from around the world that served on a voluntary basis on the Panel and its technical options committees in support of the goals of the Montreal Protocol. She then said that the Panel was committed to reinvigorating its membership, at the same time as maintaining substantial experience to ensure the continuity of its work for parties. She reminded parties that of the

18 Panel members, the terms of appointment of 8 members ended in 2017, one year before the completion of the 2018 Panel assessment reports and indicated that it was a challenge to identify new candidates with adequate experience and technical expertise, together with sufficient time and funding available. Both the Panel and the parties might therefore need to consider the overall annual workload and support for the Panel, at the time of making decisions requesting new work. She concluded the presentation by stating that the Panel welcomed the opportunity to further engage with parties to address those challenges to the future functioning of the Panel and its technical options committees.

9. Decision XXVIII/4 task force report on safety standards for flammable low-global-warming-potential (GWP) alternatives

31. The decision XXVIII/4 task force report was presented by the Co-Chair of the task force, Mr. Fabio Polonara, also on behalf of Co-Chair Mr. Peixoto. Mr. Polonara started the presentation by providing an overview of the decision, which aimed to support the timely updating of international standards for flammable low-global-warming-potential refrigerants (in a manner that was technology-neutral to enable the safe use and market penetration of low-GWP alternatives), requested the Panel (a) to liaise and coordinate with standard organizations, (b) to submit to the Open-ended Working Group at its thirty-ninth meeting a report on safety standards relevant for low-GWP alternatives, and (c) to provide relevant findings to standard bodies. He added that the report submitted to the Open-ended Working Group was to include: (a) progress in the revision of international safety standards by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), (b) information concerning test and/or risk assessment relevant to safety standards, and (c) assessment of the implications of international standards for the implementation of the decisions of the Meeting of the Parties to the Montreal Protocol on the accelerated phase-out of HCFC and HFC control measures and recommendations to parties.

32. To fulfil the task, the Panel had convened a task force of 24 members, including 16 from the Panel and its technical option committees and 8 external experts. Mr. Polonara expressed appreciation for the efforts of task force members aimed at delivering the report according to schedule. He conveyed his thanks in particular to the chapter lead authors who had had an important role in defining and organizing the structure of the report.

33. He explained that the report comprised seven chapters, the first being an introduction. Chapter 2 contained an overview of international standards for the refrigeration, air-conditioning and heat pumps sector: in general there were four main types of safety standards, two of which (product standards and group standards) were used for the refrigeration sector. In particular, for the refrigeration, air-conditioning and heat pumps sector there were currently nine main safety standards (and another one in preparation) that covered whole systems, appliances and products.

34. In continuing his presentation, Mr. Polonara indicated that safety standards could not override national legislation, but that generally, they were commonly referenced or directly copied into national legislation. The list of safety standards currently dealing with refrigeration, air-conditioning and heat pumps included four IEC60335 standards that were product standards, each of them covering a specific product. It also included four ISO5149 standards that covered the whole spectrum of sectors, plus standard ISO13043, which referred specifically to mobile air-conditioners. Standard ISO20854 for refrigerated containers was under preparation. In general, international standards were seldom used directly as most countries adopted a standard nationally, often including modifications or deviations, to the point that there were cases where national legislation entered into conflict with the text contained in the international standard. Moreover, standards tended to be expensive, complex and not available in local languages. However, compliance with safety standards was a guarantee of good practice.

35. Chapter 3 reported on the general composition and working procedures of international standards. He stressed that ISO and IEC standard procedures were effective; however, there were some limitations: international standards were somewhat lacking in terms of global uptake, their procedures were long and complex, and so were the formal stages for the development of standards. Moreover, there was a lack of opportunities for stakeholders to participate and it was time consuming and expensive to participate. Chapter 4 dealt with risk assessment, which was the basis of safety standards. In fact, when developing standards for flammability, various aspects of refrigerants were considered within the overall risk assessment, such as flammability characteristics, release/leakage, dispersion behaviour of a leaked refrigerant, potential sources and consequences of ignition including formation of decomposition products and risk mitigation systems/functions, including their combined effects.

36. Published literature on risk assessment was extensively considered when developing amendments and revisions of the applicable standards. Two specific questions come into play in relation to risk assessments: (a) understanding technical concepts related to flammability in refrigeration, air-conditioning and heat pumps equipment as reflected by improvements in the proposed requirements, and (b) the fact that while the consequences of ignition of higher flammability substances such as hydrocarbons had been widely studied for many decades, work on fluorinated substances classed as A2L was in its infancy. As new research was conducted, their behaviour was increasingly understood.

37. Chapter 5 dealt with the current state of development of safety standards. At the ISO and IEC level, there were at least five technical subcommittees responsible for the applicable safety standards, which contained working groups tasked with developing the major amendments and/or revisions of those safety standards related to alternative refrigerants. There were several options for interested parties to actively participate in relevant national committees and subcommittees, ranging from commenting on proposals and voting positions, to participating in subcommittee meetings, to contributing to working groups, and to carrying out background technical work, among other things.

38. However, in some parties, membership of national committees could also be very costly or could be restricted and thus active participation in standard development might effectively be closed to some stakeholders.

39. Chapter 6 addressed the implications of international standards for the implementation of decisions of the Meeting of the Parties. Mr. Polonara reported that in this regard an accelerated revision of national standards (and regulations) would facilitate the use of lower-GWP (flammable) refrigerants and assist non-Article 5 and Article 5 parties in achieving the agreed freeze and phase-down steps under decision XXVIII/1 (Kigali Amendment).

40. Also, given the typical five-year lead time for product development, international safety standards to be published in 2019–2020 would play an important role in the development of national regulations, which should be applicable by 2024 in non-Article 5 parties, as per the Kigali Amendment. There were also implications with regard to the available options for air-conditioning applications. Currently, the only available options were HFC-32, HC-290 and possibly some of the new low-GWP and medium-GWP flammable HFC/HFO blends. However, all of those were flammable and current standards limited the charge size for larger room air-conditioning and multi-split systems.

41. In further referring to implications, Mr. Polonara said that handling flammable refrigerants in Article 5 countries also required significant quality improvement for manufacture, installation, service and end-of-life. Currently there were some gaps in the way such aspects were addressed in the international standards, particularly for installation, service and end-of-life. The timing of standards updates and especially the speed of acceptance of such updates in national legislation would affect the range of technologies available to replace high-GWP refrigerants.

42. In making reference to chapter 7, Mr. Polonara mentioned that current international safety standards imposed varying restrictions on flammable and/or toxic medium-GWP and low-GWP alternatives, depending on the type and design of refrigeration system. Therefore, while it was technically feasible to use almost all class A flammable refrigerants in all applications, the critical issue was whether or not a given alternative could be used in a safe and cost-effective way using state-of-the-art system architectures.

43. In making recommendations to the parties, Mr. Polonara suggested that they might wish to consider: (a) supporting education and training for technicians handling flammable refrigerants, (b) establishing competence on safety standards within education programmes directed at service and maintenance personnel - currently the cost of standards and guidelines for technicians and contractors in Article 5 parties was prohibitive, (c) supporting the participation of national experts at the national and international level, and (d) accelerating the transfer of international standards for flammable refrigerants into national regulations.

44. Mr. Polonara concluded his presentation by referring once again to subparagraphs 1 (a) and 1 (c) of the decision. He said the task force suggested that parties might wish to consider providing additional guidance to the Technology and Economic Assessment Panel on establishing regular consultations on relevant international safety standards with a view to supporting the timely revision of such standards; further, they might wish to consider requesting the Ozone Secretariat to forward the report to the relevant international standards organizations, including IEC and ISO, and to establish a consultative/exchange of information process.

Annex III

List of issues arising from first replenishment contact group meeting for possible consideration by the Technology and Economic Assessment Panel in a supplementary report on replenishment 2018–2020

From general questions and responses:

1. Paragraph 3 of the terms of reference as expressed in decision XXVIII/5:

"That the Technology and Economic Assessment Panel should provide indicative figures of the resources within the estimated funding required for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives and indicative figures for any additional resources that would be needed to further encourage the use of low-GWP or zero-GWP alternatives".

2. Cost effectiveness figures in metric tonnes, ODP-tonnes and CO_2 equivalent.

3. Clearer distinction between costs associated with HCFC-related and HFC-related activities.

4. Scenario comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities.

5. Accounting for recent decisions of the Executive Committee.

Funding components

HPMP activities (Technology and Economic Assessment Panel report, chapter 3)

6. Scenarios for considering:

(a) HPMP stage III implementation activities in particular according to existing commitments in the servicing sector;

(b) Stage III activities are deferred to the next triennium.

7. Technology and Economic Assessment Panel to consider scenario where the non-LVC and LVC planned activities which are not necessary to meet the 35 per cent phase-out target are deferred to the next triennium.

HCFC production phaseout (chapter 4)

8. China HPPMP stage II and related Executive Committee assumptions in upcoming meeting.

9. Consider different scenario involving 2 tranches in the 2018–2020 triennium.

Non-investment and supporting activities (chapter 5)

10. Further thought on how to account for parties with accelerated phase-out in HPMP stage II implementation.

11. Further thought on taking into account HPMP stage III (for parties wishing to achieve the 67.5 per cent and further reductions steps earlier).

12. Scenario where stage III activities are deferred to the next triennium.

13. Consider scenario where there is no annual increase to CAP and a scenario where there is an increase of more than 3 per cent to CAP.

14. Scenario where there are no HCFC demonstration projects.

15. Scenarios for considering:

(a) HPMP stage III preparation activities in particular according to existing commitments in the servicing sector.

HFC phasedown enabling activities (chapter 6)

16. Further disaggregation of cost of enabling activities with respect to the different elements addressed.

HFC-23 mitigation (chapter 7)

17. Scenario involving closure of HCFC-22 production plants to deal with HFC-23, with or without existing incineration facilities, taking into account swing plants as one of the possible alternatives to control HFC-23 emissions.