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**Open-ended Working Group of the Parties to
the Montreal Protocol on Substances that
Deplete the Ozone Layer
Thirty-seventh meeting
Geneva, 4–8 April 2016**

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

Introduction

1. In paragraph 1 of its decision XXVII/1, entitled “Dubai pathway on hydrofluorocarbons”, the Twenty-Seventh Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer decided “to work within the Montreal Protocol to” a hydrofluorocarbon (HFC) “amendment in 2016 by first resolving challenges by generating solutions in the contact group on the feasibility and ways of managing HFCs during Montreal Protocol meetings”. To that end the Meeting of the Parties agreed in paragraph 4 of the same decision to hold in 2016 a series of Open-ended Working Group meetings and other meetings, including an extraordinary meeting of the parties. The thirty-seventh meeting of the Open-ended Working Group was the first of those meetings and was focused solely on the discussions on HFCs contemplated by decision XXVII/1, continuing the consideration of items 6 and 7 of the agenda for the Twenty-Seventh Meeting of the Parties, including the challenges and endorsed concepts listed in annexes I and II of decision XXVII/1, respectively.

I. Opening of the meeting

2. The thirty-seventh meeting of the Open-ended Working Group was held at the Centre International de Conférences Genève, in Geneva, from 4 to 8 April 2016. The meeting was co-chaired by Mr. Paul Krajnik (Austria) and Mr. Leslie Smith (Grenada).

3. The meeting was opened at 10.05 a.m. on Monday, 4 April 2016, by Mr. Krajnik.

4. In her opening statement, the Executive Secretary of the Ozone Secretariat, Ms. Tina Birmpili, first paid tribute to Dr. Mostafa Tolba, former Executive Director of the United Nations Environment Programme (UNEP) and a founding figure of the Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol, who had passed away the previous week. Describing him as a multilateralist and a visionary, she said that he would be remembered as a great leader of the global environmental movement whose groundbreaking work had touched the lives of millions of people.

5. The meeting participants stood and observed a minute of silence in honour of Dr. Tolba.

6. The Executive Secretary then turned to the agenda for the current meeting, which was limited to implementation of the “Dubai pathway on hydrofluorocarbons” adopted by the Twenty-Seventh Meeting of the Parties to the Montreal Protocol in its decision XXVII/1. In accordance with that decision, the discussions would take place largely in the contact group on the feasibility and ways of managing HFCs established at the resumed thirty-sixth meeting of the Open-ended Working Group

and continued at the Twenty-Seventh Meeting of the Parties. The aim, she said, was to generate solutions to the challenges identified in the contact group's mandate (annex I to decision XXVII/1), with the emphasis on building bridges between divergent perspectives and addressing the legitimate concerns of the parties operating under paragraph 1 of Article 5 (Article 5 parties). Attributing the past successes of the Montreal Protocol largely to its ability to translate scientific discovery into everyday moral imperatives and to the passion of its parties, she said that evidence-based policy would remain key to addressing the current challenges, which called for a focus on scaling up the science and technology to ensure the transition to HFC alternatives and on reaffirming the critical role of the Multilateral Fund for the Implementation of the Montreal Protocol.

7. She then went on to highlight a number of key challenges on which the parties had made progress in developing a common understanding at earlier meetings but which might require further discussion at the current meeting. They included flexibility in implementation, with a focus on a country-driven approach that would allow Article 5 parties to set their own sector- and technology-specific priorities and strategies based on national needs and circumstances; second and third conversions, with enterprises that had converted to HFCs in phasing out chlorofluorocarbons and/or hydrochlorofluorocarbons (HCFCs) considered eligible for support to meet incremental costs from the Multilateral Fund; guidance to the Executive Committee of the Multilateral Fund; ensuring that enabling activities for capacity-building would be supported by the Fund; exemptions for high ambient-temperature countries; the safe use of energy-efficient alternatives; and non-party trade provisions.

8. Little progress had been made with regard to issues such as conversion costs and technology transfer, however. On the Multilateral Fund, which was generally agreed to be the most appropriate funding mechanism to assist Article 5 parties in moving away from HFCs with high global-warming potential (GWP), urgent answers were needed to the questions of what levels of funding were required to assist those parties to comply with HFC control measures; which costs would be covered by the Fund; and how the indicative list of the categories of incremental costs approved by the Fourth Meeting of the Parties could apply to HFC management. With regard to the first, highly critical question, she suggested that the Technology and Economic Assessment Panel could be requested to provide an estimate, in which case the Panel would need more precise directions from the parties.

9. On the relationship between HFC management and the phase-out of HCFCs, she said that the Working Group should keep in mind, among other things, that Article 5 parties and non-Article 5 parties were at different stages of their HCFC phase-out schedules and that HFC use continued to increase rapidly in spite of the various decisions of the Meeting of the Parties aimed at discouraging parties from opting for high-GWP alternatives.

10. Other issues in need of particular attention included intellectual property rights and legal synergies between the ozone and climate regimes. In regard to the former, she suggested that the Open-ended Working Group could draw on past practices in developing options in response to significant concerns about the availability of sufficient, affordable, low-GWP alternatives; the risk of producers being at a competitive disadvantage as a result of patents preventing the use of substitutes; and whether the Multilateral Fund could compensate Article 5 parties for the cost of using patented substances and processes.

11. As to the second issue, she drew attention to a briefing note on legal issues in the context of HFC management under the Montreal Protocol, prepared by the Secretariat in consultation with the secretariat of the United Nations Framework Convention on Climate Change. The briefing note made clear that the two regimes were separate and autonomous; that the Meeting of the Parties alone had the authority to amend the Protocol and to decide whether to address HFCs, while clarification of how the climate regime would be affected by any amendment of the Protocol could come only from the Conference of the Parties to the Framework Convention on Climate Change; that any controls on HFC production and consumption under the Montreal Protocol could co-exist with measures to reduce HFC emissions under the Framework Convention; and that the Montreal Protocol could be seen as a means of achieving the emissions reductions reported under the climate regime.

12. Solutions to all the challenges, she said, would also serve to resolve the overarching challenge of the situation of Article 5 parties, for which the Protocol had historically allowed additional time for compliance with control measures and tailored baselines and reduction steps, together with financial assistance and technology transfer.

13. Highlighting what was at stake, she said that an amendment of the Protocol to phase down HFC production and use could prevent up to 105 gigatonnes of CO₂-equivalent emissions by 2050 and 0.4°C of global warming by the end of the century. To achieve that, she called on the parties to bear in mind some rules of engagement: first, there was a solution to every challenge, including through

learning by doing and making adjustments to take into account lessons learned, as the parties had historically done; second, a constructive path forward required the will to listen to diverging views and ensure that proposed solutions were fair; third, the focus had to be on finding ways to address well-known arguments rather than on continuing to repeat those arguments; and, fourth, success demanded that the parties stand by their agreements and avoid re-opening previously agreed matters. The Secretariat, she said, stood ready to support the parties as they undertook to tackle one of the greatest challenges of modern time.

II. Organizational matters

A. Attendance

14. The following parties to the Montreal Protocol were represented: Albania, Angola, Argentina, Australia, Austria, Bahamas, Bahrain, Belarus, Belgium, Benin, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Canada, Chile, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Czech Republic, Democratic Republic of the Congo, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, European Union, Finland, France, Gabon, Gambia (the), Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Haiti, Holy See, Honduras, Hungary, India, Indonesia, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lesotho, Libya, Madagascar, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mexico, Micronesia (Federated States of), Mongolia, Morocco, Mozambique, Myanmar, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Palau, Panama, Paraguay, Philippines, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Rwanda, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Slovakia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, the Former Yugoslav Republic of Macedonia, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, 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 and Zimbabwe.

15. The following United Nations entities, organizations and specialized agencies were represented as observers: secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, United Nations Environment Programme, United Nations Development Programme, United Nations Industrial Development Organization, the World Bank and the secretariat of the United Nations Framework Convention on Climate Change. Also in attendance were representatives of the Scientific Assessment Panel and the Technology and Economic Assessment Panel of the Montreal Protocol.

16. The following intergovernmental, non-governmental and industry bodies were represented as observers: Alliance for Responsible Atmospheric Policy, Arkema, S.A., Asahi Glass Co., Ltd., Center for Climate and Energy Solutions, Centre for Science and Environment, The Chemours Company, Climalife, Climate Advisers, Council on Energy, Environment and Water, Daikin Industries, Devcco District Energy Venture, European Partnership for Energy and the Environment, Environmental Investigation Agency, GIZ Proklima, Gluckman Consulting, Gujarat Fluorochemicals Limited, Honeywell, ICF International, Ingersoll Rand, Institute for Governance and Sustainable Development, International Institute of Refrigeration, The Japan Refrigeration and Air Conditioning Industry Association, Johnson Controls, Lawrence Berkeley National Laboratory, Lennox International, Mexichem UK Limited, Natural Resources Defense Council, Öko-Recherche GmbH, Refrigerants Australia, Refrigerant Reclaim Australia, Shecco, SRF Limited, United Technologies Corporation. An independent fluorochemicals consultant also attended.

B. Adoption of the agenda

17. The Working Group adopted the following agenda on the basis of the provisional agenda set out in document UNEP/OzL.Pro.WG.1/37/1:

1. Opening of the meeting.
2. Organizational matters:
 - (a) Adoption of the agenda;
 - (b) Organization of work.
3. Report by the Technology and Economic Assessment Panel on information on alternatives to ozone-depleting substances (decision XXVII/4).

4. Dubai pathway on hydrofluorocarbons (HFCs) (decision XXVII/1):
 - (a) Resolving challenges by generating solutions on the feasibility of managing HFCs;
 - (b) Ways of managing HFCs, including the amendment proposals submitted by parties (UNEP/OzL.Pro.27/5, UNEP/OzL.Pro.27/6, UNEP/OzL.Pro.27/7 and UNEP/OzL.Pro.27/8);
 - (c) Work within the Montreal Protocol to an HFC amendment in 2016 under decision XXVII/1: process for moving forward.
5. Adoption of the report of the meeting.
6. Closure of the meeting.

C. Organization of work

18. The Working Group decided that it would conduct the bulk of its discussions in the contact group on the feasibility and ways of managing HFCs, co-chaired by Mr. Patrick McInerney (Australia) and Mr. Xia Yingxian (China), which had been established at the resumed thirty-sixth meeting of the Open-ended Working Group and continued at the Twenty-Seventh Meeting of the Parties. In accordance with the mandate set out in decision XXVII/1, the contact group would first take up agenda item 4 (a) before turning to items 4 (b) and 4 (c). The contact group would be open to participation by all, and reports on its progress would be made in plenary each day. As no plenary sessions would be held concurrently with those of the contact group and the interpreters would therefore be otherwise idle, it was agreed that, without setting a precedent for future meetings, interpretation in the six official languages of the United Nations would be provided for the sessions of the contact group.

III. Report by the Technology and Economic Assessment Panel on information on alternatives to ozone-depleting substances (decision XXVII/4)

19. Introducing item 3 of the agenda, the Co-Chair of the Open-ended Working Group recalled that in decision XXVII/4 the Meeting of the Parties had requested the Technology and Economic Assessment Panel to prepare a report for consideration by the Open-ended Working Group and an updated version of that report for consideration by the Twenty-Eighth Meeting of the Parties. Both versions of the report would update and provide new information on alternatives to ozone-depleting substances, based on the guidance and assessment criteria provided in subparagraph 1 (a) of decision XXVI/9 and taking into account the most recent findings on the suitability of alternatives for use in high ambient temperatures, highlighting a number of important issues such as market penetration, refrigeration systems in fishing vessels, new substances in development, energy efficiency, warming impacts and costs. The decision also asked the Panel to update and extend to 2050 all the scenarios in the 2015 report prepared by the Panel in response to decision XXVI/9.

20. Ms. Bella Marañon, Mr. Lambert Kuijpers and Mr. Roberto Peixoto, co-chairs of the task force established by the Panel to prepare the reports called for in decision XXVII/4, gave a presentation on the report before the Working Group at the current session,¹ stressing that it was one of three that the Panel intended to produce during 2016 in response to the decision. The report provided an update on new refrigerant alternatives introduced, information on research studies on alternatives for use under high ambient temperature conditions and the extension of the mitigation scenarios for the refrigeration and air-conditioning sector from the decision XXVI/9 report to 2050. A second report would be produced for the thirty-eighth meeting of the Open-ended Working Group, covering the other issues listed in decision XXVII/4, and an updated report would be produced for the Twenty-Eighth Meeting of the Parties, which would take into account the discussions at the thirty-seventh and thirty-eighth meetings of the Working Group and would be based on additional information available to the task force.

21. A summary of the presentation, prepared by the presenters, is set out in annex I to the present report.

¹ http://conf.montreal-protocol.org/meeting/oweg/oweg-37/presession/Background_documents/TEAP%20TF%20XXVII-4%20Report%20March%202016.pdf.

22. In the discussion following the presentation, all of the representatives who spoke thanked the Panel and task force for their work in preparing the initial report in the short time available, and a number of representatives posed questions regarding matters highlighted during the presentation or discussed in the report.
23. Responding to the questions, Mr. Kuijpers clarified that the fifteen new refrigerants highlighted in the presentation were only those that had appeared since the publication of the decision XXVI/9 report in September 2015. The full report listed a total of about eighty alternatives that were being tested, most of which were blends rather than pure fluids and were being developed by industry for possible future use; very few of them were yet commercially available, and it was quite possible that most of them would never be widely used.
24. While parties understandably wanted a comprehensive list of alternatives to HCFCs and high-GWP HFCs, together with information on their costs, availability, energy efficiency, safety issues related to application and other considerations, much of that information was not readily available. The task force was still at the stage of expanding the list of technically feasible alternatives put forward and gathering information on them, and much of the data that would be needed for a full assessment did not yet exist. The report described the current situation, which would evolve as new substances and blends were tested, and could not currently offer guidance to the parties on which alternatives to adopt. He said that chemical companies were generally using well-established HFCs, blending them with very-low-GWP substances in order to obtain lower-GWP fluids. The conclusion of the Panel was that it was unlikely that any radically new alternatives would become available; future options seemed more likely to lie in combining existing substances with new fluids in various blends, with the possibility of redesigning equipment to suit their characteristics.
25. The mitigation scenarios developed by the Panel assumed that high-GWP refrigerants would be replaced, particularly in the stationary air-conditioning and commercial refrigeration subsectors, with a variety of refrigerants with an average GWP of 300. It was currently extremely difficult, however, to calculate the total climate impacts of different alternatives because they depended on many additional factors such as the type of equipment used and the level of energy consumption that would result from the use of the new fluids.
26. The scenarios used production data reported for 2014 and 2015 and, based on a number of assumptions about rates of economic growth, equipment lifetimes and equipment leakage, projected future rates of growth of demand for HFCs. They were bottom-up studies based on extrapolated data on the quantity of various types of equipment expected to be in use in various regions and their charges. Two final national and regional regulations applicable to non-Article 5 parties had been incorporated into the model. The impact of some other final or pending national HFC regulations in non-Article 5 parties had not yet been incorporated into the models, but in practice that should make little difference compared to what had been presented.
27. The major issue to be observed was the difference in anticipated growth in consumption between non-Article 5 parties and Article 5 parties. The assumption of a six-year conversion period used in the mitigation scenarios in the report related to the conversion of manufacturing facilities only. Total phase-out of the substances used in those facilities would require more time. Given the need for the servicing of equipment produced until the end of its useful life, a six-year conversion period probably implied a twenty-year period for the complete phase-out of specific HFC refrigerants. In addition, the six-year conversion period was merely illustrative, intended to illustrate possible impacts, and should not be considered to be a realistic projection of a prescriptive character.
28. Responding to a question about the lack of a comparison between the performance of R-22 and R-410A in the high-ambient-temperature testing projects, Mr. Peixoto clarified that the Panel had summarized the results reported by the organizations that had carried out the projects, and he suggested that representatives might wish to approach those organizations directly for further information.
29. He said that the cost of alternatives for use in new systems under high-ambient-temperature conditions was currently difficult to quantify because relevant testing projects had either used existing equipment or had developed prototypes. Equipment components needed to be designed to match the physical characteristics of the refrigerants they contained. Thus, when companies chose alternatives to commercialize, they would design the equipment to suit them, and it was only after that process had been completed that costs would become clear. For some alternatives, including several hydrocarbons, the information on costs that was available related only to products designed for use under non-high-ambient-temperature conditions.

30. Mr. Kuijpers added that testing of alternatives in high-ambient-temperature conditions was still under way; some of the projects discussed in the report were not yet complete and there was much work still to be done to identify the most efficient and effective options. Mr. Peixoto stressed, however, that the results of the tests to date were encouraging, showing good results even with equipment that had not been optimized for the alternatives being tested, and it could be expected that such optimization would produce even better performance and help to clarify costs. Responding to questions about the definition of “high ambient temperature”, Mr. Kuijpers recalled that the issue had been discussed in detail in the decision XXVI/9 report.

31. In response to a suggestion from several representatives, Mr. Peixoto agreed that, when possible, it would be helpful to publish a combined table, or matrix, of information on all the potential alternatives and their potential uses, including information on what was known about their costs, energy efficiency, cooling capacity, flammability, toxicity and other features; the matrix could also indicate gaps in existing knowledge. He acknowledged that the potential of not-in-kind alternatives had not been covered in the report, saying that it would be included in the next version of the report and would also be discussed in the report of the Refrigeration, Air-Conditioning and Heat Pumps Technical Options Committee for the 2018 quadrennial assessment.

32. Ms. Maranion added that the task force would welcome any additional information on topics covered in the report. As she had observed during the presentation, the task force had had only limited time to prepare the report, and it was primarily intended to be an update on previous reports; the next version of the report, for the thirty-eighth meeting of the Open-Ended Working Group, would cover a wider range of issues. The current version nevertheless conveyed an important message, which was that the physical characteristics of many alternatives were becoming increasingly well understood and that innovation in equipment design to make best use of them could be expected, which would also help to clarify questions about their costs. Similarly, the results of the studies of alternatives for use in high-ambient-temperature conditions undertaken to date were very promising.

33. During further discussion of the report, several representatives, including one speaking on behalf of a group of countries, reiterated requests for a consolidated matrix of information on alternatives, saying that it would be helpful, among other reasons because it could bring together information that had been published in several different reports over the preceding several years. One representative said that the report as it stood was not sufficiently user friendly and that it should include a matrix that helped parties to easily identify the alternatives available for a given application and provided information about their shortcomings.

34. Several representatives, including one speaking on behalf of a group of countries, highlighted matters that they said should be treated at greater length in future reports, including not-in-kind alternatives, environmentally sound technologies, absorption technologies and flammability and the impact of existing safety standards. Several other representatives said that there was a need for information on the costs of alternatives, including but not limited to those for use in high ambient temperatures, and on the definition of high ambient temperature.

35. One representative said that the report showed that delay in phasing down HFCs would come at a significant cost. It also showed that the pace of technological change was rapid; the testing of as many as 80 alternatives was very encouraging, and further improvements in effectiveness could be expected from the redesign of equipment. The parties, working together with the Technology and Economic Assessment Panel, should be able to work together to adopt an amendment to phase down the use of HFCs and fulfil the Dubai pathway that had been agreed the previous year.

36. It was agreed that interested parties would meet informally with members of the Panel in the margins of the current meeting to pose any further questions that they might have, to share information and to provide guidance for the next version of the report.

37. At a later stage in the meeting, Mr. Kuijpers reported on the informal discussions with parties, saying that the Panel would do its best, within the time available, to incorporate into the next version of the report as many of the additional elements suggested by parties as possible, which included information about not-in-kind alternatives to refrigerants, the safety of alternatives, including any need for special training for their use in servicing, and any further outcomes of the testing programmes for alternatives under high-ambient-temperature conditions; as well as a consolidated overview of the status of those alternatives, which would probably be presented in table format. The positive outcomes of the testing programmes to date would also be reflected in the report’s summary. The Panel would also attempt to build into the mitigation scenarios information on the current size of banks of HFCs; data on HFC production; information on the impacts of all existing and forthcoming national HFC regulations, compared to a business-as-usual scenario with no regulations in place; clarification regarding estimated growth rates; and information on the impacts of longer manufacturing conversion

periods. One party mentioned that the points his delegation had raised in the informal discussions, including with regard to information on the negative outcomes of testing, a clear definition of the term “environmentally sound” and risk assessment with regard to alternatives, had not been reflected in the summary presented. After further informal discussion with the party concerned, Mr. Kuijpers presented a corrected summary with the addition of the points that had been omitted. He concluded by inviting parties wishing to provide additional comments or information to contact the Panel as soon as possible. A written version of Mr. Kuijpers' revised report is set out in annex II to the present report.

38. It was agreed that parties wishing to submit additional information or suggestions to the Panel would do so by 19 April 2016 to the Ozone Secretariat and that the submissions would be posted on the Secretariat's website.

IV. Dubai pathway on hydrofluorocarbons (HFCs) (decision XXVII/1)

39. As described in section II-C, above, on the organization of the work of the meeting, the Open-ended Working Group agreed to convene the contact group on the feasibility and ways of managing HFCs to address, in accordance with the mandate for the group set out in decision XXVII/1, agenda items 4 (a) (Resolving challenges by generating solutions on the feasibility of managing HFCs), 4 (b) (Ways of managing HFCs, including the amendment proposals submitted by parties (UNEP/OzL.Pro.27/5, UNEP/OzL.Pro.27/6, UNEP/OzL.Pro.27/7 and UNEP/OzL.Pro.27/8)) and 4 (c) (Work within the Montreal Protocol to an HFC amendment in 2016 under decision XXVII/1: process for moving forward). It was agreed that during its deliberations the contact group would consider a conference room paper submitted by African States setting out explanatory text and draft decision text on certain funding issues.

40. Subsequently, at the final session of the current meeting, on Friday, 8 April, the co-chair of the contact group reported that the group had concluded a first review of all the challenges listed in its mandate and had made significant progress in generating solutions, including the text proposal with agreed concepts and elements with regard to an exemption for high-ambient-temperature countries (see annex III to the present report) and the solutions to some aspects of challenges related to funding and flexibility in implementation (see annex IV to the present report).

41. Regarding the exemption, he said that the group had agreed on a definition of “high ambient temperature”, as well as a provisional list of high-ambient-temperature countries, that could be approved in principle. The group had agreed, however, that consideration should be given to refining the definition, and possibly expanding the list of high-ambient-temperature countries to include more countries, based on information to be provided by the Technology and Economic Assessment Panel and the Scientific Assessment Panel at the thirty-eighth Open-ended Working Group meeting. He also noted that while the contact group had developed the text on the basis of the proposed amendment set out in document UNEP/OzL.Pro.WG.1/37/3, the group did not intend to prejudge what amendment might be adopted and was of the view that the agreed exemption text could be adapted to any eventual amendment adopted. He noted too that paragraph VI of the agreed exemption would allow for the transfer of production and consumption allowances to ensure that manufacturers of HFCs and related equipment in non-high-ambient-temperature countries could continue to supply HFCs and equipment to high-ambient-temperature countries for use in accordance with high-ambient-temperature exemptions.

42. Regarding the issues related to funding and flexibility in implementation, he reported that agreement had been reached on solutions to some aspects of the challenges, as outlined in the document set out in annex IV to the present report. Significant progress had been made with regard to other funding issues, but the parties needed more time to reach agreement on them. Their informal discussions, which are reflected in a table to be made available, could be used only as information for the next meeting. He expressed confidence that the contact group could reach agreement on those and other outstanding issues when it next met. Accordingly, the contact group proposed that it be reconvened in the period leading up to the thirty-eighth meeting of the Open-ended Working Group to allow it to finalize its work in delivering on the Dubai Pathway. In conclusion, he reported that one representative had expressed concern that informal discussions on funding had not been fully inclusive and that the progress of informal discussions should not be formally reported to the contact group. The delegate had requested that future discussions be inclusive. He had asked, and the co-chair had agreed to recommend to the Working Group, that his concern be reflected in the present report.

43. In the ensuing discussion it was agreed that the thirty-seventh meeting of the Open-ended Working Group would be suspended and that it would be resumed prior to the thirty-eighth meeting of the Working Group, at a time and place to be determined by the Secretariat, for the purpose of continuing the discussions under agenda item 4, including the discussions in the contact group. The

Secretariat was requested to factor the costs of that, and any other additional meetings deemed necessary, into a revised budget for 2016 to be submitted for consideration by the Twenty-Eighth Meeting of the Parties.

44. At the suggestion of one representative, it was also agreed that the Secretariat would prepare an information document that would consolidate the four amendment proposals showing how each of the proposals would affect the text of the Montreal Protocol, article by article. That document would serve as information for the ensuing discussions.

45. In addition, one representative read out proposed text regarding exemptions to address the scarcity of alternatives in some sectors that might arise towards the end of any phase-out period adopted as part of an HFC amendment to the Protocol. The text, she said, had received significant support from other delegations during informal consultations at the current meeting. Another representative suggested that as the text had only been discussed in informal consultations and had not yet been discussed in the contact group it should not yet be considered by the Working Group in plenary session. The co-chair of the Working Group also observed that all solutions had to be generated in the contact group and then brought up in plenary. It was accordingly agreed that the text would be discussed in the contact group when it next met.

V. Adoption of the report of the meeting

46. The parties adopted the present report on Friday, 8 April 2016, on the basis of the draft report set out in document UNEP/OzL.Pro.WG.1/37/L.1. The Ozone Secretariat was entrusted with the finalization of the report following the suspension of the meeting.

VI. Closure of the meeting

47. At 12.10 a.m. on Saturday, 9 April 2016, the Working Group agreed to suspend the current meeting and, as indicated in section IV above, to resume it prior to the thirty-eighth meeting of the Open-ended Working Group for the purpose of continuing its work under agenda item 4 only.

Annex I

Presentation by the members of the decision XXVII/4 task force

Ms. Bella Maranion, task force co-chair, started the presentation on the report prepared in response to decision XXVII/4 for the thirty-seventh meeting of the Open-ended Working Group, reviewing the text of decision XXVII/4 and the composition of the task force that had prepared the report, which included members from the Technology and Economic Assessment Panel, its relevant technical options committees and outside experts. She outlined some general considerations including the similarity between the current and previous decisions related to alternatives to ozone-depleting substances; the short time frame of six months between the final report prepared in accordance to decision XXVI/9 and the current report; the focus on updating information and avoiding repetition where information had not changed from previous reports; the interpretation of the phrase “total warming impact” in decision XXVII/4 as meaning “total climate impact”; and the availability of reliable data for the business-as-usual (BAU) and mitigation scenarios for the refrigeration and air-conditioning (R/AC) sector and the lack of such data for other sectors. The Panel had taken a three-part approach in its response to decision XXVII/4, with a first report for the thirty-seventh meeting of the Open-ended Working Group focused on R/AC only and including updates on alternative refrigerants, information on research studies on alternatives under high ambient temperature conditions and extension of the BAU and mitigation scenarios to 2050. For OEWG-38, a second report would include further updates for the R/AC sector information based on discussions at the thirty-seventh meeting of the Open-ended Working Group, respond to other parts of the decision, including by providing information on alternatives to refrigeration systems on fishing vessels and updating and extending scenarios for sectors other than R/AC to the extent that necessary information was available. For the Twenty-Eighth Meeting of the Parties an updated report would be submitted, as appropriate, following discussions during at the thirty-seventh and thirty-eighth meetings of the Open-ended Working Group. She then outlined the chapters of the current report to be presented.

Mr. Lambert Kuijpers, co-chair of the task force, then presented an update on the status of refrigerant alternatives. He said that the report discussed 15 new fluids, mostly refrigerant blends, introduced since September 2015 and he noted that while the search for new fluids (new molecules and blends) might yield more economical system designs, the discovery of radically different refrigerant fluids seems unlikely. Energy efficiency depended on many parameters, including system configuration, component efficiencies, operating conditions, operating profiles, system capacities, system hardware, system controls and other factors. There were two possible approaches to determining energy efficiency: first, by the use of a system architecture suitable for a specific refrigerant, while comparing it with a reference system for the refrigerant to be replaced; and, second, by screening for alternative refrigerants suitable for a given system architecture, with only minor modifications. He said that both approaches raised two questions: “how much modification of the system architecture was economically feasible?”; and “was a consistent comparison possible?”.

Mr. Roberto Peixoto, co-chair of the task force, then elaborated on the status of the various projects testing alternatives under high ambient temperature (HAT) conditions. They included projects entitled “Promoting low-GWP Refrigerants for Air-Conditioning Sectors in High-Ambient Temperature Countries” (PRAHA), to be published in the near future; the “Egyptian Project for Refrigerant Alternatives” (EGYPRA), which was ongoing; the Oak Ridge National Laboratory (ORNL) High-Ambient-Temperature Evaluation Program for low-global warming potential (low-GWP) Refrigerants Phase I (report published in October 2015) and Phase II (to be started in 2016); and the Alternative Refrigerant Evaluation Program (AREP) Phase I (concluded in 2014 with 40 test reports published) and Phase II (to be concluded in the near future, with 27 test reports already published and the last 7 to be available in the near future). He then provided further details on the status and some results of the various testing projects. He noted that the current HAT project testing parameters differed significantly, making results difficult to compare. Nevertheless, the refrigerants tested showed promise in meeting specific current R/AC equipment requirements for operation under HAT conditions. He also noted that comparable testing parameters in future testing and field trials would be helpful in assessing results. He said that there was a need for a comprehensive risk assessment for flammable alternatives at installation, servicing and decommissioning under HAT conditions, and he noted that the commercial availability of both new refrigerants and components for the optimization of R/AC equipment would affect any transition.

Mr. Kuijpers then presented the BAU and selected mitigation demand scenarios extended to 2050 for both Article 5 (A5) and non-Article 5 (non-A5) parties for the R/AC sector. He pointed out that other aspects of those scenarios remained the same as in the decision XXVI/9 report, namely the final European Union F-gas regulation and United States of America regulations prohibiting the use of certain HFCs, which were considered in the non-A5 BAU scenarios; the GWP values of the refrigerants with an average GWP of 300 for low-GWP refrigerant blends; the different manufacturing conversion periods for A5 and non-A5 parties; the mitigation scenarios with varied years for the commencement of manufacturing conversions (MIT-3: all R/AC subsectors in 2020; MIT-4: all R/AC subsectors in 2020 except stationary A/C, which was assumed to be delayed to 2025; and MIT-5: all R/AC subsectors in 2025). Between 2015 and 2050, the non-A5 BAU scenario showed 300 per cent growth while the A5 BAU scenario showed 800 per cent growth. The stationary A/C sub-sector most affected demand over the period. He also noted that, due to uncertainties in production data, economic growth assumptions, equipment parameters and other factors, the period 2015–2050 might be too long to meaningfully assess, with significant uncertainty with regard to later years.

He also showed the total demand for the MIT-3 and MIT-5 scenarios for Article 5 parties. The 5-year later start of manufacturing conversion in the MIT-5 scenario resulted in a peak demand that was 60 per cent higher than in MIT-3; furthermore, the demand estimated for the MIT-5 scenario in 2030 was twice that for MIT-3. Again, stationary A/C was the determining subsector, followed by commercial refrigeration. He noted a number of specific features relating to manufacturing demand in Article 5 parties in the MIT-3 and -5 scenarios. Thus in the MIT-3 scenario, manufacturing was estimated to peak at 500 Mt CO₂-eq (2020), while in the MIT-5 scenario the peak was expected to about 750 Mt CO₂-eq., occurring about 5 years later. The values for servicing had peaks at more or less the same level, but occurring 3 or 4 years later; the decrease in demand was slower than the decrease in demand for new manufacturing. After 2040–2045, the total demand values for MIT-3 and MIT-5, the new manufacturing and servicing values, were the same again, with the impact of manufacturing conversion and the servicing of old equipment not noticeable anymore. In considering the demand over various manufacturing conversion periods, a six-year conversion period resulted in a fast decrease of the total demand in both MIT-3 and MIT-5. A 12-year conversion period resulted in a very slow decrease of the total demand in the 5–10 years after that conversion began. For all conversion periods, the total demand in the MIT-5 scenario was almost twice as much as in the MIT-3 scenario. That showed clearly the impact of an early start and a rapid conversion, while delaying or extending the conversion for the dominant stationary A/C sector significantly increased overall climate impact. In terms of overall climate impact, he presented the A5 total integrated high-GWP HFC demand and reductions compared to BAU for the periods 2020–2050 and 2020–2040; for the period 2020–2040, the total integrated high-GWP HFC demand in A5 5 parties was estimated at 42,300 Mt CO₂ eq. for BAU, 10,600 Mt CO₂ eq. for MIT-3 (75% reduction), 15,600 Mt CO₂ eq. for MIT-4 (63 per cent reduction) and 18,800 Mt CO₂ eq. for MIT-5 (56 per cent reduction).

He then made a number of important observations. Shifting the start of all R/AC subsector conversions to later than 2020 (as, for example, 2025 in the MIT-5 scenario), results in a substantially higher demand (climate impact) beyond 2030 for Article 5 parties in particular. For a six-year conversion period, if the year conversion start is chosen as the “starting point”, an average annual reduction rate of 5 per cent in total demand results in all the scenarios studied; for longer conversion periods, the average annual reduction rate would be lower. He concluded the presentation by outlining the next steps in the work of the decision XXVII/4 task force. For the thirty-eighth meeting of the Open-ended Working Group, the task force would produce a second report further updating the R/AC sector information based on discussions at the thirty-seventh meeting of the Working Group, responding to other parts of the decision, including information on alternatives to refrigeration systems on fishing vessels, and updating and extending scenarios for sectors other than R/AC to the extent that new information became available to the task force. For the Twenty-Eighth Meeting of the Parties, the task force would produce a report that was updated, as appropriate, following the discussions at the Working Group’s thirty-eighth meeting.

Annex II

Summary of the informal consultations between members of the decision XXVII/4 task force and parties in the margins of the thirty-seventh meeting of the Open-ended Working Group

Parties provided comments on the report prepared for the current meeting in response to decision XXVII/4 and suggestions for the second report to be prepared under that decision in an informal discussion session with the Panel on Thursday 7 April from 1 to 2.30 p.m. The parties' comments and suggestions are summarized below. All the comments will be taken into consideration by the task force created in response to the decision in the time remaining before the thirty-eighth meeting of the Open-ended Working Group, and the second report will be submitted for consideration by the Working Group at that meeting.

Update on refrigerants

- The report should include updates and information on not-in-kind (NIK) technologies.
- Further consideration should also be provided with regard to safety, with the aim of advancing technologies to meet current safety standards in relation to the new alternatives. With regard to servicing, the report should address whether use of the alternatives, including flammables, would require specialized training, including with regard to use under HAT conditions.
- A request was made to address criteria in paragraph 1 (a) of decision XXVI/9, including whether alternatives are “environmentally sound”, in order to avoid having to revisit in the future decisions that are made in selecting alternatives. Additionally, the term “environmentally sound” could be further elaborated.

Testing of alternatives under high ambient temperature (HAT) conditions

- A Party that had proposed language regarding consideration of a HAT exemption in the contact group offered to share information with TEAP on the criteria and data used; the party also noted that it would welcome other alternative approaches.
- The section in the report that discusses the results of the testing of alternatives under HAT conditions were actually positive, and that positive outcome along with any negative outcomes of the testing should be better reflected in the executive summary of the report. The executive summary of the report, however, should also indicate that certain elements such as risk assessment were not included in the alternatives testing.
- The cost element should be reflected in a contextual manner to include the cost of in-kind replacement and full or partial system redesign.
- A couple of parties suggested that it would be helpful if the report could include an overview of the status of the various alternatives based on the testing, not in additional discussion within the report but perhaps in a table so that key information would be in one place.
- A party asked for HAT considerations to include some additional uses, including in industrial equipment, chillers and other sub-sectors such as transport air conditioning; additional uses mentioned were for cooling mines in South Africa and propane-driven technologies in Australia.

Scenarios

- A party said that some idea of the magnitude of current HFC banks would be helpful.
- A request was made on whether the TEAP reported annual production of HFCs could be split into specific values for HFC production by country.
- A party suggested that the report should clarify that only certain HFCs were included in the production figures.
- With regard to the business-as-usual (BAU) scenario, not all existing regulations were used, so the Panel was requested to investigate whether the report could further consider all relevant regulations in addition to a number of corporate commitments and changes in national procurement regulations.

- A party requested whether the report could show a BAU scenario that did not incorporate any regulatory actions.
- Further clarification is needed on the estimated growth rates that were used compared to refrigerant demand growth.
- A request was made as to whether the impacts of a manufacturing conversion period of 18 years could be calculated and incorporated.
- The decision XXVI/9 report included estimated costs and emissions reductions for the various mitigation scenarios; a request was made to include those costs and benefits in the second report to be prepared in response to decision XXVII/4.
- A party requested that the scenarios show demand (and refrigerant banks) on a regional basis.

Annex III

Outcome of the contact group in respect of a high-ambient-temperature exemption

Amendment Text

To be added as paragraph 7 of Article 2J:

“Paragraphs 1–4 of this Article will apply to calculated levels of production and consumption save to the extent that a high ambient temperature exemption applies based on criteria decided by the Parties.”

High Ambient Temperature

- I. A new exemption as described shall be available to Parties with high-ambient-temperature conditions where suitable alternatives do not exist for the specific subsector of use.
- II. The exemption shall be distinguished and separate from the essential use and the critical use exemptions under the Montreal Protocol.
- III. The exemption shall take effect and be available at the commencement of the HFC freeze or other initial control obligation and shall have an initial duration of 4 years.
- IV. The exemption applies for subsectors contained in Annex [X] in Parties: (1) with an average of at least two months per year over 10 consecutive years with a peak monthly average temperature above 35 degrees Celsius¹; and (2) that have formally notified use of this exemption by notifying the Secretariat no later than one year before the HFC freeze or other initial control obligation, and every 4 years thereafter should it wish to extend the exemption.
- V. Any party operating under the high-ambient-temperature exemption shall report separately production and consumption data for the subsectors to which a high-ambient-temperature exemption applies.
- VI. Any transfer of production and consumption allowances for the high-ambient-temperature exemption shall be reported to the Secretariat under Article 7.
- VII. The Technology and Economic Assessment Panel (TEAP) and a TEAP subsidiary body that includes outside expertise on high ambient temperatures shall assess the suitability of HFC alternatives for use where suitable alternatives do not exist based on criteria agreed by the Parties and can recommend to add or remove subsectors to Annex [X], that shall include, but not be limited to, the criteria listed in paragraph 1 (a) of Decision XXVI/9,² and report this information to the Meeting of the Parties.
- VIII. The assessment shall take place periodically starting 4 years from the date of the commencement of any HFC freeze or other initial control obligation and every 4 years thereafter.
- IX. The Parties shall review, no later than the year following receipt of the TEAP report on suitability of alternatives, the need for an extension of this exemption for specific sub-sectors for a further period(s) of up to 4 years, and periodically thereafter. The Parties shall develop an expedited process to ensure the renewal of the exemption in a timely manner where there are no feasible alternatives, taking into account the recommendation of the TEAP and its subsidiary body.
- X. Amounts of Annex F substances that are subject to the HAT exemption are not eligible for funding under the Multilateral Fund while they are exempted for that Party.

¹ Spatially weighted average temperatures deriving the daily highest temperatures (using the Centre for Environmental Data Archival: http://browse.ceda.ac.uk/browse/badc/cru/data/cru_cy/cru_cy_3.22/data/tmx).

² insert criteria from XXVI/9 para (1)(a)

XI. That the Implementation Committee and Meeting of the Parties should, for 2025 and 2026, defer the consideration of the HCFC compliance status of any party operating under a high-ambient-temperature exemption in cases where it has exceeded its allowable consumption or production levels due to its HCFC-22 consumption or production for the subsectors listed in Annex [X], on the condition that the Parties concerned follow the phase-out schedule for consumption and production of HCFCs for other sectors, and the Party has formally requested a deferral through the Secretariat.

XII. Parties should consider no later than 2026 whether to extend the compliance deferral in paragraph XI for an additional period of two years, and may consider further deferrals thereafter, if appropriate, for countries operating under the high-ambient-temperature exemption.

Annex [X]: List of Exempted Equipment for High Ambient Temperatures

- Multi-split air conditioners for commercial and residential
- Split ducted air conditioners (residential and commercial)
- Ducted commercial packaged (self-contained) air-conditioners

List of HAT countries

Algeria	Kuwait
Bahrain	Libya
Benin	Mali
Burkina Faso	Mauritania
Central African Republic	Niger
Chad	Nigeria
Côte d'Ivoire	Oman
Djibouti	Pakistan
Egypt	Qatar
Eritrea	Saudi Arabia
Gambia	Senegal
Ghana	Sudan
Guinea	Syria
Guinea-Bissau	Togo
Iran	Tunisia
Iraq	Turkmenistan
Jordan	United Arab Emirates

Annex IV

Solutions from the Informal Group consulting on challenges regarding funding issues and flexibility in implementation

Overarching principles and timelines

To address the HFC phase-down, the Parties agree to revise within one year after the adoption of the amendment, procedures, criteria and guidelines of the MLF.

In addressing the HFC phase-down, revise the rules of procedure of the ExCom with a view to building in more flexibility for Article 5 Parties.

The Chair of the Executive Committee must report back to the Meeting of the Parties on the progress made in accordance with this decision, including on cases where Executive Committee deliberations have resulted in a change in the national strategy or the national technology choice submitted to the Executive Committee.

Principles on 2nd and 3rd conversions

That first conversions, in the context of a phase-down of HFCs, is defined as conversions of enterprises to low-GWP or zero-GWP alternatives that have never received any direct or indirect support, in part or in full, from the MLF, including enterprises that converted to HFCs with their own resources.

That enterprises that have already converted to HFCs in phasing out CFCs and/or HCFCs will be eligible to receive funding from the MLF to meet agreed incremental costs in the same manner as enterprises eligible for 1st conversions.

That enterprises that convert from HCFCs to high-GWP HFCs, after the adoption of an HFC amendment, under HPMPs already approved by the ExCom will be eligible to receive funding from the MLF for a subsequent conversion to low-GWP or zero-GWP alternatives to meet agreed incremental costs in the same manner as enterprises eligible for 1st conversions.

That enterprises that convert from HCFCs to high-GWP HFCs with their own resources before the freeze date of HFC phase-down will be eligible to receive funding from the MLF to meet agreed incremental costs in the same manner as enterprises eligible for 1st conversions.

To agree that enterprises that convert from HFCs to lower-GWP HFCs with MLF support when no other alternatives are available will be eligible to receive funding from the MLF for a subsequent conversion to low-GWP or zero-GWP alternatives if necessary to meet the final HFC phase-down step.

Sustained aggregate reductions

Remaining eligible consumption for funding in tonnage will be determined on the basis of the starting point of the national aggregate consumption less the amount funded by previously approved projects in future multi-year agreement templates for HFC phase-down plans (Consistent with Dec. 35/57).

Enabling activities

Enabling activities will be supported by the MLF in any HFC phase-down agreement.

Capacity-building and training for handling HFC alternatives in the servicing sector, the manufacturing and production sectors

Institutional Strengthening

Article 4b Licensing

Reporting

Demonstration projects

Developing national strategies